Volume 62

American Machinist

New York, April 30, 1925

Number 18

Industrial Preparedness

By Dwight F. Davis
Assistant Secretary of War

The steps that are being taken to insure the United States against the losses of another world war—Allocation of facilities

A TASK of enormous magnitude is involved in the supply of an army with all the munitions and supplies required in modern warfare. There is hardly an article of commerce which is not used to a gerater or lesser extent—and chiefly greater—by an army in the field. In addition, many articles which have no commercial application whatever are required in enormous quantities. These are frequently highly complex and require much highly specialized knowledge and experience in their making. An airplane bomb sight, a 75-mm. field gun, a gas mask are examples of what I mean.

Such material adds very greatly to the difficulties of our industrial problem in the event of war. Another serious difficulty is the huge expansion in personnel with which the office of the Assistant Secretary of War and the supply branches are confronted on the occurrence of a major emergency. Despite the utmost care in selection, beyond a doubt there will be many cases of misfits—square pegs will get into round holes and perhaps pegs will be used which should not have been used at all—and even the best of the new personnel will require a certain amount of time to adjust themselves to the new conditions. This trouble will by no means be peculiar to the War Department. It will apply with equal force to such super-agencies as the War Industries Board, the War Trade Board and similar agencies. Industry will be confronted with the same trouble and, in addition, will be confronted with losing many of its best men to the government service.

After the World War, an extended series of hearings was held by committees of Congress in order that our military laws might be revised in the light of our experience. As a result, the amended National Defense Act of June 4, 1920, finally was passed and became the law of our land. This marks an important epoch in our military history and especially so in two respects. For the first time the traditional policy of the United States in utilizing the Regular Army as a trained nucleus and a first line of defense behind which the National Guard and our potential manpower can be mobilized found formal expression on the statute books. This act further recognizes the dependence of military effort on industrial mobilization and the fact that the industrial experts on whom we must rely to carry out our industrial war plans in detail are normally in industry and not in military life.

The amended National Defense Act makes a clear division between activities which are military and those which correspond to the business of ordinary, everyday life. The former are under the supervision and control of professional, military men, the General Staff and the Chief of Staff, and the latter under the supervision and control of a civilian, the Assistant Secretary of War. The specific section of the Act which lays down the duties of the Assistant Secretary reads as follows:

> "Sec. 5a. . . . the Assistant Secretary of War, under the direction of the Secretary of War, shall be charged with supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision for the mobilization of material and industrial organizations essential to war-time needs. . . ."

Attention is especially invited to the wording of the Act. The Assistant Secretary is charged with *supervision* and not *operation*. Operation is left where it belongs. The chiefs of the seven supply branches, the Quartermaster Corps, Engineer Corps, Signal Corps, Ordnance Department, Medical Department, Air Service and Chemical Warfare Service, have a full measure of control over the operations of their respective branches. Nothing is done which will operate to interfere with each of them carrying out their respective missions. But due co-ordination and co-operation is to be insured by means of the supervision of the office of the Assistant Secretary of War.

The Office of the Assistant Secretary of War has been organized with a Director of Procurement in direct charge of those activities which have to do with industrial preparedness and industrial mobilization. The office is divided into divisions and sections very largely along the lines of the War Industries Board during the World War.

Having an organization in accordance with law and regulations, the questions which present themselves when the matter of industrial preparedness is needed, are:

> What do we want?
> How much do we want?
> Where and When do we want it?

The answers to these questions must be specific and

in detail. We cannot tell a manufacturer of trucks, for instance, that we want some trucks. He wants to know exactly how many are wanted and what the proposed schedule of delivery is. He wants some assurance that he can get his essential equipment and raw materials under war conditions. He wants to know what difficulties with respect to power, labor and transportation he is likely to incur. If the trucks are special and not his regular line of production, he wants to have drawings and specifications and he wants these to be at least reasonably stable against change of design during the course of the contract.

The answers to these questions hinge on military considerations and involve policies and decisions made by the General Staff. The chief sources of information are:

Organization Tables which are tables prepared by the General Staff, showing in complete detail the organization or every unit which goes to make up our Army. These tables show, for instance, the composition of a company of infantry, a regiment of artillery or a cavalry brigade.

Tables of Basic Allowances which give the equipment and allowances for each individual soldier and for each unit of the Army. They show, for instance, the allowances of shoes for a regiment of infantry.

Tables of Rates of Fire which show the average rates of fire to be anticipated for each gun in the theater of operations. Similar tables or other General Staff data give corresponding information as to the consumption rates of other items of supply. Frequently consumption rates are estimated by the supply branches upon war experiences.

The Basic Mobilization Plan which lays down the proposed rates of mobilization of our manpower in the event of an emergency, the rates at which the men mobilized will be organized into units and begin their training, and the rate at which they may be expected to enter the theater of operations.

Knowing the above data, it is an arithmetical problem, modified somewhat by the necessity of applying commonsense factors to the process and not proceeding blindly and mechanically, to compute what the requirements for supplies and munitions will be, month by month, after the occurrence of an emergency. The work of computing these requirements is well under way and may be said to be approaching completion. Of course, there will always be a slow shifting of requirements. One item will become obsolete and be superseded by another, organizations will be modified from time to time, and other things will occur to make it necessary to recheck the computations periodically, but, as stated above, the great bulk of the work is done. In passing, it is interesting to note that a total of about 14,000 items of issue are involved. Many of these are complex and the total number of components involved is prodigious. Take, for example, the receiver of the Springfield rifle shown in Fig. 1, surrounded by the gages used in connection with its manufacture.

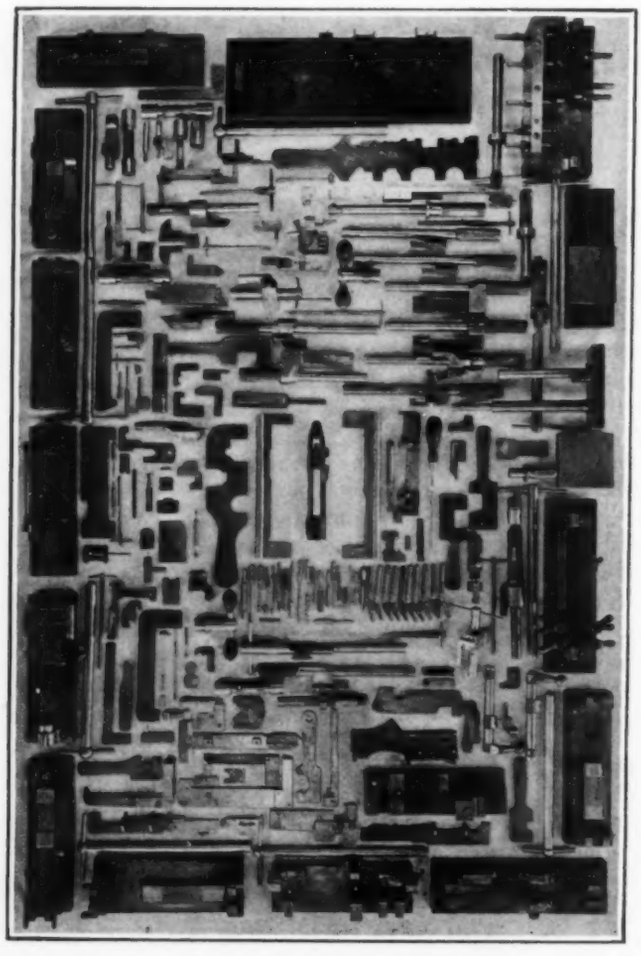


Fig. 1—Receiver for the Springfield Rifle and the gages used in making it

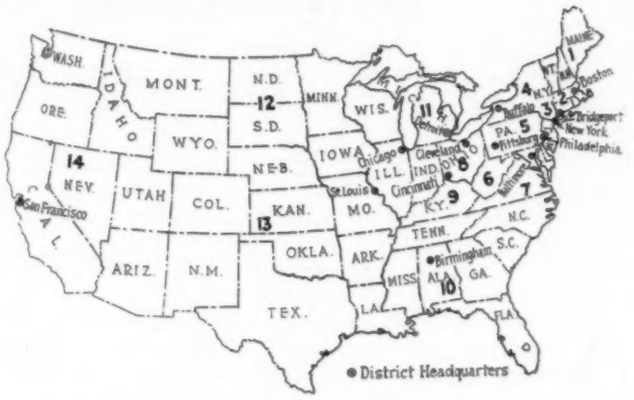


Fig. 2—The fourteen procurement districts

In going from a known war plan and computed requirements to the actual procurement plan, the principle of centralized control and decentralized operation is applied. The United States has been divided into fourteen districts for procurement purposes. These districts are as shown in Fig. 2, and are about the same as those used by the War Industries Board except that the old St. Louis district of that board has been divided to form the present St. Louis and San Francisco districts and the old Cincinnati district has been divided to form the new Cincinnati and Birmingham districts. Each of the seven supply branches, in turn, forms its own procurement districts but these must either coincide with the War Department districts or be made by consolidating two or more War Department districts. The supply branch districts are formed as shown in Fig. 3. If made by consolidation, the records of a district must be so kept that the parts pertaining to the War Department districts may be readily separable if it later becomes desirable to break the district up into

its constituent parts. Furthermore, in time of war a representative of each supply branch will be stationed at the headquarters of each of the fourteen War Department districts so that there may be quick and easy co-operation between the branches in the field and the necessity of referring any but the most important questions to Washington for decision be avoided.

To illustrate, the New York district of the Quartermaster Corps is composed of the New York, Bridgeport and Buffalo districts of the War Department. The peace-time records of this district are required to be kept in three separate parts corresponding to the constituent War Department districts. In time of war it may be found desirable to split the district into three Quartermaster Corps districts to correspond to the War Department districts. If so, the separate records will make this easy. If not, the Chief of the New York district of the Quartermaster Corps will have representatives at Bridgeport and Buffalo so that the chiefs of the other supply branch districts at these places can quickly secure any necessary Quartermaster data and co-operation.

How Allocations Are Made

As noted above, the Assistant Secretary of War has no operating function. The chiefs of branches are responsible for the operations pertaining to their respective missions. In turn, they delegate to their district chiefs the functions of procurement, production, inspection and acceptance for activities pertaining to their branches in the various districts. The war load on a district is determined by the allocation to it of its share of the total requirements computed as outlined above, for certain specific items. These allocations are made by the central office of the supply branch and are based upon known commercial (and military) conditions. For instance, knowing the total requirements for 75-mm. high-explosive shell, the Chief of Ordinance has allocated to each district the duty of procuring a certain part of the total.

After receiving such allocations, it is the duty of the district chief, in turn, to allocate to specific manufacturers "war orders" in such amounts that the total war orders placed shall equal the total allocations to his district. This work is well under way. It is pertinent to remark that the co-operation and assistance which is being received from industry is highly gratifying. In many cases, bills of material, route sheets and plant lay-outs are being prepared and everything practicable being done to place the plants in readiness to start operations without lost motion. As no government funds are available to pay for it, this work is being done at the contractor's expense. His only reward is his knowledge of the performance of a patriotic action and the peace insurance due to a position of industrial readiness to meet an emergency promptly.

In order to prevent confusion and annoyance to contractors who accept war orders, the supply branches do not approach a prospective contractor until they receive a clearance from the office of the Assistant Secretary of War, known technically as "the allocation of a facility." Facilities are allocated to the branches upon request of the chiefs of branches. Only in exceptional cases is the same facility allocated to two or more branches. In such cases, the matter is handled in such a manner that the plant management is not left in the dark but knows, when first approached, approximately what the entire war demands upon it will be. At the present time a total of about fourteen thousand allocations of facilities have been made.

War contracts have given much trouble. Both during the World War and since, they have been a prolific source of trouble to the United States and to individual contractors. In order to avoid as much of this difficulty as possible in a future emergency, a Board to Standardize War Contracts has been working on the problem for a long time. At the present time it has completed a Purchase Order Form, a Short Contract Form, a Fixed Price Adjustable Contract Form, and an Adjustable Compensation Construction Contract Form.

The first of these forms is practically the same as the present peace-time order.

The Short contract is based upon the Standard Contract for Materials and Supplies which will be promulgated by the Bureau of the Budget in the near future with such additions as the Board deem necessary to adapt it to war-time use.

The Fixed Price Adjustable Contract is an elaborate instrument wherein are set forth all the details of the contract, including the estimated amounts which the contractor will spend on the various parts of the work. This contract provides for an adjustment in the total price, upward or downward, according to the fluctuations in the price of labor or material as compared to the prices existing upon the date of signing the contract. In other respects, it is a Fixed Price Contract, and the contractor will stand to make or lose under it according to whether or not his estimate of the quantities, efficiency of labor, etc., have been accurate.

The Adjustable Compensation Contract for Construction has been prepared and will, in a short time, be paralleled by a similar form for the procurement of manufactured articles. These two forms can probably be best described as contracts with a fixed fee and under which the contractor will participate in whatever savings he is able to make upon the estimated cost. It is really a fixed fee and bonus contract, being, in principle, diametrically opposed to the old Cost-Plus Contract,

WAR DEPARTMENT PROCUREMENT DISTRICTS
CHART SHOWING HEADQUARTERS OF THE VARIOUS SUPPLY BRANCHES

W.D. DISTRICT NO.	WAR DEPT. DISTRICT HEADQUARTERS	SUPPLY BRANCHES: QUARTERMASTER CORPS	ORDNANCE DEPT.	AIR SERVICE	CORPS OF ENGINEERS	MEDICAL DEPT.	SIGNAL DEPT.	CHEMICAL WARFARE SERVICE
1	Boston	●	●	○	○	●	○	●
2	Bridgeport	○	●	○			○	○
3	New York	●	●	●	●	●	●	●
4	Buffalo	○	●	●	○	○	○	○
5	Philadelphia	●	●	○	○	●	○	○
6	Pittsburgh	○	●	○	○	○	○	●
7	Baltimore	●	●	○			○	○
8	Cleveland	○	●	Dayton ††	○		○	○
9	Cincinnati	Jeffersonville ††	●	○	○	○	○	○
10	Birmingham	New Orleans ††	●	○	○	Atlanta ††	○	○
11	Detroit	○	●	●	○	○	○	○
12	Chicago	●	●	●	●	○	●	●
13	St. Louis	●	●	○	○	●	○	○
14	San Francisco	●	●	●	●	●	●	●
TOTAL NO. OF DISTRICTS		14	9	14	6	6	7	3	5

Key:—
● Headquarters of Supply Branch District
○ W.D. Districts included in Supply Branch Districts
†† Peace-time Organization

Fig. 3—The supply branch district organization

inasmuch as every inducement is offered the contractor to save money. This inducement exists, of course, in the Fixed Price Contract Form, but in that case, if savings are made, the contractor secures the entire benefit, whereas, under the bonus form, he gets only a percentage of the savings and that percentage is based upon a sliding scale—the Government receiving the vast bulk of the savings in any event.

None of these forms has as yet been finally approved by the Secretary of War. They have either already been sent out for criticism or are now in the field for this purpose. Upon receipt of criticisms requested, necessary revisions will be undertaken and the question of their finality will be determined by the Secretary of War.

In addition to the work of the War Time Contract Board, the War Department Board of Contracts and Adjustments is working in conjunction with the Interdepartmental Board of the same name in the production of standard contract forms for use in time of peace, for construction, for the purchase of supplies, and probably a third form for the procurement of services, not personal. This board is also working on a new contract code which will probably be introduced in the next Congress. This code modernizes and consolidates in one act a very large number of contract statutes now on our law books, and, if enacted, will go a long way toward bringing Government methods more clearly into conformity with regular business methods than has been possible in the past.

Demands of Other Agencies

Not the War Department alone, but every other agency of the Government will make war demands upon industry. Next in size to those of the War Department are the demands of the Navy. The total demands of those two departments will amount to perhaps 90 per cent of the whole war load. Co-operation between the departments is, therefore, of the utmost importance. Such co-operation is being secured by means of the Army and Navy Munitions Board. This board is constituted of the Assistant Secretary of War and the Assistant Secretary of the Navy. Under the Board is a Procurement Policy Committee, consisting of the Director of Procurement and a corresponding officer representing the Assistant Secretary of the Navy. Under the direction of the Army and Navy Munitions Board and the Procurement Policy Committee there are nine special committees which do the actual work of co-ordinating procurement. These committees are constituted by the appropriate chiefs of the various supply branches and bureaus of the War and Navy Departments. To illustrate, the Ordnance Committee is composed of the Chief of Ordnance of the Army, the Chief of the Bureau of Ordnance of the Navy and the Major General Commandant of the Marine Corps.

The work of these committees is very effectively securing the desired results. For instance, a complete agreement has recently been reached with respect to the procurement of smokeless powder in war.

When we have determined our requirements, by completed articles, for issue to troops and arranged for their procurement, our task is by no means complete. The contractors with whom war orders have been placed must be assured that their requirements for plant equipment and raw materials will be met. The first step here is to determine what the total requirements for equipment and material are. To do this makes it necessary to work back from our known requirements for finished articles, step by step, until they can be translated into terms of raw materials and plant equipment.

The organization formed to handle the question of getting these materials, after our requirements are known, is patterned after the commodity committees which functioned so successfully under the War Industries Board. Fifty-four of these committees are being formed and each committee is being assigned specific items to study. In time of peace the committees consist of representatives from each supply branch concerned with the commodity in question, the chairman coming from that branch which is the chief user. To illustrate, the Committee on Non-Ferrous Metals consists of representatives of the Ordnance Department, the Quartermaster Corps and the Air Service. It has been directed to prepare studies on chromium, manganese, tungsten and vanadium. Other metals will be assigned, from time to time, as the studies proceed, until the whole group is covered.

These committees are in touch with industry and know who the leading experts along the various lines are, and where to go for specific and detailed information. In time of war civilian experts will be called in to become members of the commodity committees either as reserve officers or as civilians, the Regular Army representatives then functioning chiefly as liaison officers with their respective branches.

The above gives, in general outline, the plan for procurement in time of war which is being worked out under the direction of the Assistant Secretary of War. It will be a number of years before this plan can be said to be complete. Naturally it will never be finished in the sense that it can be put away in a pigeon hole to await the event of an emergency. It will always be necessary to revise it periodically in order that it may be kept up to date and meet changing conditions imposed by the improvement of old instruments of war and the invention of new.

Preparedness has a higher function than that of making ready for war. The greatest service that our annual expenditures for war purposes can render is that of keeping us out of war. America, in no sense of the term, is a militaristic nation, and our history emphasizes that point. Our people do not want war; we covet no other nation's territories; our place in the sun is entirely satisfactory to us. It is inconceivable that we shall ever bring on a world war by any act of aggression upon our part. Our only real concern is our national defense. With the immense resources of men and material at our disposal, it only remains for us to be in a position to use them in the most appropriate and effective manner when the need arises. This, I believe, is being accomplished under the provisions of the National Defense Act of June 4, 1920.

Teaching Workmen Waste Elimination

Gerard Swope, president of the General Electric Co., Schenectady, N. Y., at the Industrial Round Table of the National Civic Federation maintained that waste elimination can be greatly furthered if the thought of the workers can be directed to the subject. He related that in an organization of 60,000 workers, 8,000 suggestions were received in 1923, and 10,000 in 1924. Of these 5,000 had been put in practice, and $100,000 had been paid, over and above wages.

The Railroad Shops of Argentina

By George S. Brady

Origin of the Argentine railroads—The principal systems — Data concerning the various shops—The equipment and sources of supply

THE workshops of the railroads of Argentina are typical of the operation of large capacity repair shops situated at great distances from the sources of supply of materials. There is no developed iron and steel industry in the Argentine Republic; and as local manufacturing is still in its infancy, the railroads are dependent upon the supply of materials from the United States and Europe, or on what they can produce in their own workshops. During the war period they were thrown largely upon their own resources, and the development of their shops to meet the emergency has had a permanent effect.

The port of Buenos Aires, into which the railroads largely center, is 18 days south of New York and 23 days from Liverpool by fast mail steamers. Reaching back from the ports the Argentine systems cover a vast area always inclining further away from the source of supplies.

Argentina has approximately 24,000 miles of primary railroads, besides many secondary and industrial lines, easily placing the country at the front of all the Latin American Republics in railroad mileage. The area of the country is only equal to that part of the United States east of the Mississippi and Missouri Rivers, but its extent north and south is very great, being equivalent to the stretch from the center of Mexico to the Hudson Bay.

There are 23 primary railroads in the Republic, 10 of which are British owned, 3–French, 1–Argentine, and 9–State and Provincial. Seventy per cent of the total mileage is British owned and operated. The largest and most important from every standpoint are the British owned broad gage, 5 ft. and 6 in., which link up the chief cities. The following list of the principal roads with mileage, gage, and rolling stock will give an idea of the mechanical problems to be confronted by these lines in their isolated position.

Railroad	Miles	Gage	Locomotives	Passenger Cars	Freight Cars
Buenos Aires Southern.	3,948	5 ft. 6 in.	697	845	13,832
Buenos Aires Pacific...	3,362	5 ft. 6 in.	661	523	11,709
Central Argentine.....	3,305	5 ft. 6 in.	695	886	18,443
Buenos Aires Western..	1,882	5 ft. 6 in.	348	474	7,718
North Central Argentine.....	3,055	3 ft. 3¼ in.	486	540	10,430
Central Cordoba.....	1,205	3 ft. 3¼ in.	271	405	6,640
Santa Fe.....	1,188	3 ft. 3¼ in.	185	216	5,509
General of Buenos Aires.....	790	3 ft. 3¼ in.	104	128	2,538
North East Argentine..	752	4 ft. 8½ in.	64	73	1,122
Entre Rios.....	729	4 ft. 8½ in.	90	118	2,159

The rolling stock of the Argentine railroads had its origin in 2 locomotives and a few cars shipped out from England in 1856 for the Western Railroad. This equipment had been destined for the Crimean Campaign, and was of the Russian gage of 5 ft. and 6 in. It was from this accidental choice of a gage that the Argentine broad-gage railroads began. The present extensive systems are combinations of a large number of smaller lines, and as a result the rolling stock which has been acquired by many companies over a long period of years is a varied and miscellaneous assortment. All of the British broad-gage lines have lately been standardizing their stock and all of the freight cars now brought out from Europe are of steel construction throughout. The standard 20-ton car has two axles and those of 30, 40, and 45-ton have two trucks, or four axles.

The repair shops of the Beunos Aires Southern are the largest and most important of the Argentine railroad shops. They are located at Remedios de

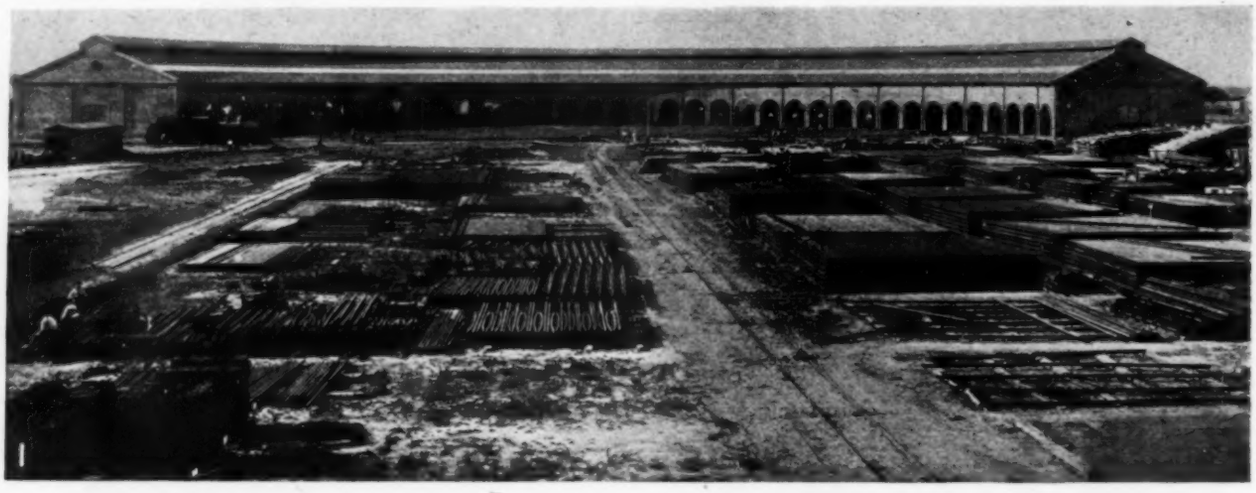


Fig. 1—Locomotive roundhouse and storage depot of the French owned Santa Fe Railroad at Santa Fe

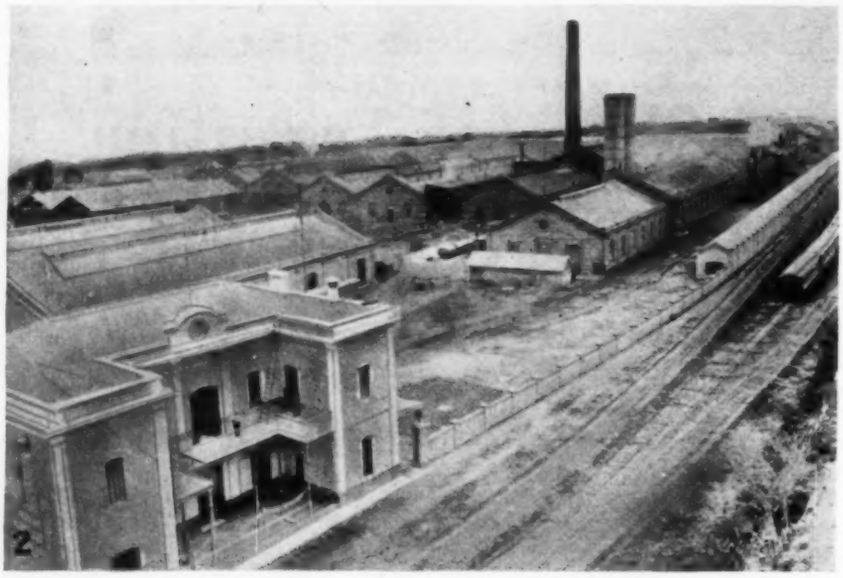


Fig. 2—Shops of the Argentina State Railroad at Tafi Viejo

Fig. 3—Another view of the same shops showing the overflow repair yard for locomotives

Fig. 4—One of the Santa Fe's storehouses at Santa Fe

Escalada, 7 miles from Buenos Aires. The total area of the shops and warehouses under cover is approximately 20 acres, and the number of employees reaches 2,700. The shops are primarily for repair work, but they are mechanically equipped to manufacture practically every part of a locomotive or car. All of the passenger and baggage coaches are built in the shops, and all parts pertaining to locomotives have been entirely made with the exception of the boiler shell and the cast-steel parts, which latter, however, are completely machined in the shops.

The shops and foundry are housed in brick buildings and are served with electric traveling cranes with capacity up to 30 tons. All machinery is electrically driven, either by individual motor or by group drive. The groups are usually run from shafts 100 to 150 ft. in length. Due to the fact that the shops have been increased gradually over a period of years, the arrangement is not thoroughly modern, but the company now has approved plans for rebuilding.

The present extent of the locomotive repair work is 20 a month for general repairs, from 4 to 6 light repairs being classified as one general repair. Besides the light and heavy repairs to the vehicle rolling stock the shops are building one or two complete new passenger coaches a month, and assembling the steel freight cars that are being brought out from Europe.

The Perez locomotive shops and the Rosario carshops of the Central Argentine Railroad are also worthy of special note. The former are at Perez Station, 10 miles from the city of Rosario. The shops and yards cover an area of 69 acres, and employ an average of 1,500 men. The carshops at Rosario cover 70 acres with their yards, and employ 1,825 workmen. The organization is amongst the best of the Argentine railroad shops, and the most modern methods of scheduling and control of production are employed. At Perez, a corps of inspectors, who are trained locomotive erectors, make daily reports to the control office on the progress of each locomotive through the works, which information is plotted regularly on a schedule board. The time allowed in the shops for a locomotive undergoing complete overhauling is 64 days.

The iron foundry at Perez, which has 2 five-ton cupolas, makes all castings for the Rosario carshops as well as for the Perez works. The brass foundry is equipped with 4 pressure oil furnaces taking 400 lb. of metal at a charge, and 5 coke furnaces of 300-lb. capacity each.

The main building at the Perez shops is 420 ft. x 1,000 ft., and contains the principal machine shop and the erecting shop. It has 4 50-ton electric traveling cranes, 2 of 40-ton, 3 of 25-ton, 2 of 10-ton, and 2 of 5-ton capacity.

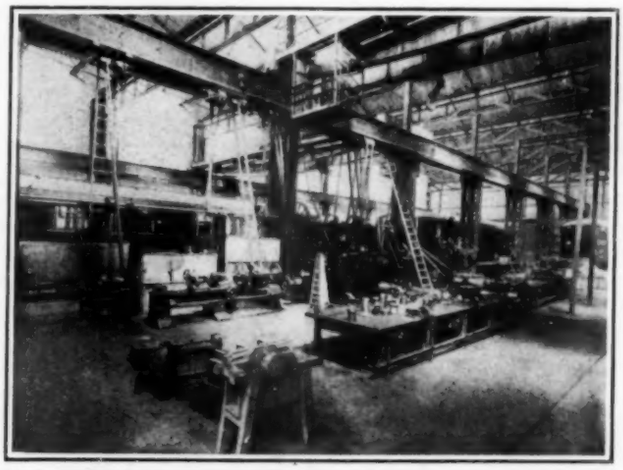


Fig. 5—A corner of the Buenos Aires Western's repair shop for electric rolling stock

The State Railroad shops at Tafi Viejo, 725 miles northwest of Buenos Aires, occupy 42 acres and employ 1,900 workmen. The buildings are of brick construction with steel and glass sawtooth roofs. The layout and equipment is modern. The machinery is of both European and American manufacture. There are over 300 machine tools in the plant, all of which are motor driven. The boiler shop has two 100-ton Niles electric traveling cranes.

A workman's village is built behind the Tafi Viejo

shops on a site covering 14 squares. The houses and apartments are of concrete block and are rented at low rates to the workmen. The railroad administration also operates a school, a theater, a market, and a co-operative store, in connection with the village.

The other important shops, whose size and extent of work is worthy of mention, are as follows:

Central Cordoba workshops.....	Alta Cordoba.....	1,025 workmen
Pacific Railway workshops.....	Junin.....	2,200 workmen
Western Railway workshops.....	Liniers.....	1,700 workmen
State Railway workshops.....	Tafi Viejo.....	1,800 workmen

All of these shops are illustrative of what can be accomplished under the pressure of necessity when cut off from the source of supplies. The Argentine railroads not only suffered from lack of new equipment and spare parts during the war years, but they also found it difficult to obtain the raw materials with which to work. Even the small pieces of scrap steel were saved, to be forged into billets and bars, and ingenious methods were devised for salvaging anything which could be made usable in any way. Some of these methods have been retained as permanent economies, because the distance from the manufacturing countries still makes them worth while.

At the Central Cordoba workshops bar steel is regularly manufactured from old boiler tubes. These are flattened and cut into short lengths, after which they are piled in alternate layers and securely bound into a cube. After being brought to a white heat the bundle is forged under a heavy steam hammer. Even drawbars are being made from this reclaimed steel.

All of the Argentine railroad shops have highly developed uses for acetylene and electric welding. The Southern, the Pacific, and the State Railroads have their own oxygen generating plants. Very heavy welding is done, such as the repairs to the ends of connecting rods, and the rebuilding up of the worn ends of axles, the sides of journal boxes, and wheel flanges. The Western and the North Central Argentine have found it to be more economical to use electric welding for the heavier work.

Each of the workshops has its foundry, and a wide range of castings are made in iron and the non-ferrous metals. The monthly run of iron at the Southern's foundry is 200 tons, and of brass and bronze 45 tons. Both the Southern and Central Argentine employ about 70 per cent scrap iron to 30 per cent pig in the cupolas, while the Pacific uses 75 per cent scrap iron. The Central Cordoba is the only one of the European owned railroads that uses iron freight-car wheels, and it breaks up the old wheels for remelting in its foundry.

Nearly all of the foundries employ machine molding on duplicate work. About 60 per cent of the molding at the Junin shops of the Pacific is by machine, and the cost is reckoned at about half the cost of hand molding. During the operation of the Bahia Blanca Northwestern by the Pacific the former's foundry at Bahia Blanca, which has capacity of 60 tons a month, was turned over almost entirely to the production of brake shoes and grate bars.

In addition to the repair and manufacture of parts for rolling stock, all of the shops make switches, cross-overs, and other materials for the permanent way departments of the railroads.

The sawmill and carpenter shop is an important part of each one. In every case this department is well equipped. The native and Paraguayan hardwoods are used largely in car building and for construction timbers. Paraguayan cedar, which is somewhat similar to the "Spanish cedar" of the North, is also employed extensively. But the native hardwoods are extremely heavy, and usually come only in short pieces, so that American yellow pine is preferred when long timbers are needed, or when large posts are employed in car building. The Western Railroad has found that the native lapacho timbers used as flooring in cattle cars will last without replacement for 6 years while an oak floor will go through only one season. Many of the native woods are very beautiful when polished, and they make fine coach trim. Peteribí, with a luster somewhat like our cherry, is largely used for interior work. Some excellent wood carving is done in these hardwoods, the carvers being mostly Italians.

Lubrication is a problem that has not been ignored by the mechanical departments. High-grade lubricating oils are all imported, and the relatively high costs have resulted in much study being given to this factor. A number of the roads have adopted the system of turning over their rolling stock lubrication to an oil company and paying on a mileage basis. One American company has contracts with a number of the lines, including the State Railroad.

The subject of boiler feed-water is another matter that has given much trouble. The desert area that extends through the center of Argentina from north to south contains water that is highly impregnated with sodium sulphate and sodium carbonate. An American manufacturer of boiler compounds has now practically monopolized the market and has contracts with the roads for treating their feed-waters.

Present Sources for Supplies

The British- and French-owned railroads adhere strictly to the custom of ordering supplies through their home offices in London and Paris. In fact, the local purchasing agents and storekeepers are only authorized to buy locally certain small standard supplies or to meet emergencies. Requisitions by cable can sometimes be received in a little over a month, but it more frequently takes from 4 to 6 months to receive the parts ordered. In the past, therefore, it has been necessary to keep considerable stocks on hand. When it is considered that the Southern has more than 30 types of locomotives alone it can be judged that these stocks on hand and enroute must be very heavy. All of the large lines are now manufacturing as much as possible locally, and on account of cheap labor, low overhead expenses, and lowered stocks this has been found to be economical.

It is estimated that 90 per cent of the machinery in the British owned shops in Argentina is of British manufacture. This is the natural outcome of the foreign investment policy followed in London. The first installations were bought through the London offices, and there continues to be an interlocking of financial interests that keeps the business largely at home. It often occurs that directors and officials of the railroads are officers of British manufacturing plants, mines, and oil companies. In this same way American manufacturers would reap a benefit from more American investments in Latin American countries. The type of non-British machinery consists of American heavy wheel lathes and forging machines, American air compressors, and French and American woodworking machinery.

Mechanical Aids to Motion Study

By K. H. Condit
Editor, *American Machinist*

Photographic apparatus for motion study records—The microchronometer for recording time—Cyclegraphs of various types—Motion models, the magster and simultaneous motion cycle charts

MOTION study was begun with only the crudest mechanical devices to aid the investigators. As a consequence the first results were disappointing. Remember that the start was made thirty-odd years ago when many of our modern mechanical marvels were either in experimental laboratories or else undreamed of.

The greatest problem connected with motion study, or in fact with almost any scientific study, is the

Fig. 17—Stereocyclegraph of drilling operation

accurate measurement of the various units involved. In any study of economic human endeavor the element of time is a vital one. Experiments with the several clocks, watches and stop-watches used by time-study observers were made by the Gilbreth engineers in their early motion studies but they were found to be too slow and too subject to observational errors to be adequate. Eventually a chronometer was developed that could be made to record intervals as short as a millionth part of an hour if such refinement was found to be necessary. With this clock, which was called a microchronometer, placed beside the subject being studied, it was possible to photograph the motions made and record at the same time the exact instant at which each event occurred. Naturally the motion picture camera was used for the purpose.

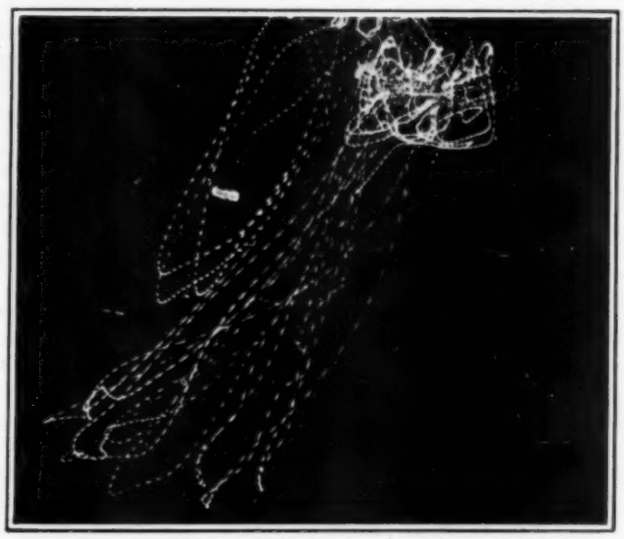


Fig. 18—Half of a stereochronocyclegraph showing direction

Difficulty was encountered even with the best motion picture camera equipment in singling out the particular motions that were of most interest to the observer. The expedient that solved this problem consisted of attaching a small electric light bulb to the finger, arm or other part of the body the motions of which were being studied. As it was obviously impossible to show more than a brief portion of any motion cycle on a cycle motion picture frame, the whole path of the

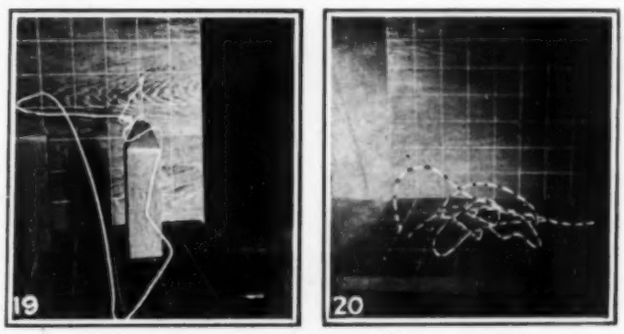


Fig. 19—A plain wire motion model. Fig. 20—Motion model with dots painted on

motion under analysis was taken on a single photographic plate of the ordinary variety. Nothing but the path of the light, of course, appeared on the plate and the line traced on the plate was really only a plane projection of the actual path. This device was christened the "cyclegraph."

To get the path of the motion into three dimensions recourse was had to a stereoscopic camera and the resultant light-path picture was called a "stereocyclegraph." Such a picture appears in Fig. 17. It was made of a drill press operator.

In reverting from the motion picture with its accompanying microchronometer to the single plate the time element was lost. To recover it a device was developed to interrupt the flow of current to the object lamp at stated intervals. The result was a series of light dashes on the plate that could be counted to give the desired time intervals but it was difficult sometimes to determine the direction of motion because of the many

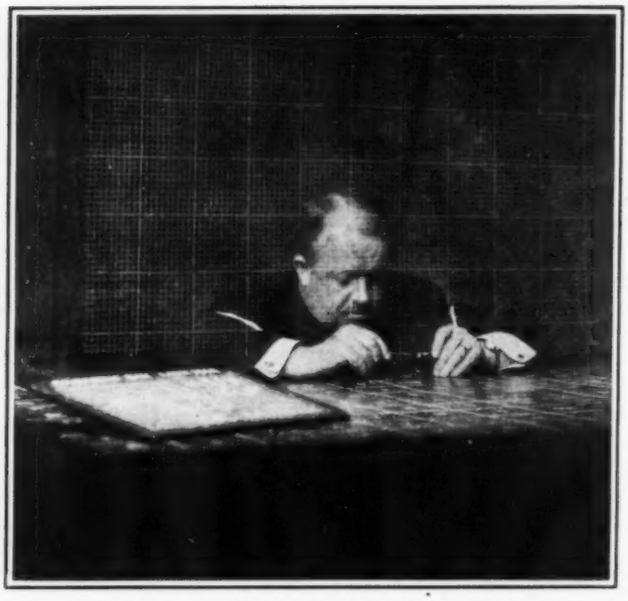


Fig. 21—Photograph through a disappearing screen

crossings and recrossings of the light trace. By arranging the interrupter so that the light flashed on quickly and died out slowly the light dashes on the recording medium took on the appearance of small arrow heads with points indicating the direction of the motion. As the final picture shows a complete cycle of motions, stereoscopically and with the time element included, it is called a "stereochronocyclegraph showing direction." A rather complicated one is the subject of Fig. 18.

For those undertaking a serious study of motion cycles it has been found very helpful to construct wire scale models of the cyclegraphs like the one shown in Fig. 19. The making of the model aids the mind to visualize the actual path of the motion cycle and eventually leads the student to a point where he can visualize motions readily from the motion picture record. If desirable the wire models can be painted white and the light dots indicated with black and gray paint, one shading into the other to give the effect of pointed dots as shown in Fig. 20.

To introduce more accurate means of measuring distances moved through during different portions of the cycle it was found possible to include in the picture a "disappearing" cross-section screen, Fig. 22. This was accomplished by holding in the desired position—in front of, in the plane of, or behind the work—a sheet of black paper with white cross-section lines painted on it, and exposing the plate briefly. The sheet was then removed and the motion cycle carried on in the usual way before the same negative. With proper exposures both the motion cycle and the cross-section lines of the screen appeared in the finished picture.

Fig. 22—The magster in use

It was possible, of course, to make several exposures of the screen in various positions so that the subject could be inclosed in a six-sided box if anything could be gained by such elaboration.

The latest contrivance designed to aid in the study of micromotion films is the "magster," or magazine stereoscope as will be seen in Fig. 22. This instrument consists of an ordinary stereoscope mounted on a frame on which are also two rollers that can be turned by a crank. The two strips of positive prints from a stereoscopic motion picture negative are mounted on a linen sheet and attached to the rollers so that they can be moved backward and forward in front of the stereoscope while the observer studies the section of the motion cycle that interests him. He can turn the roll fast enough so that the motion will be reproduced at its original speed or he can slow it down or stop it at will to analyze an element.

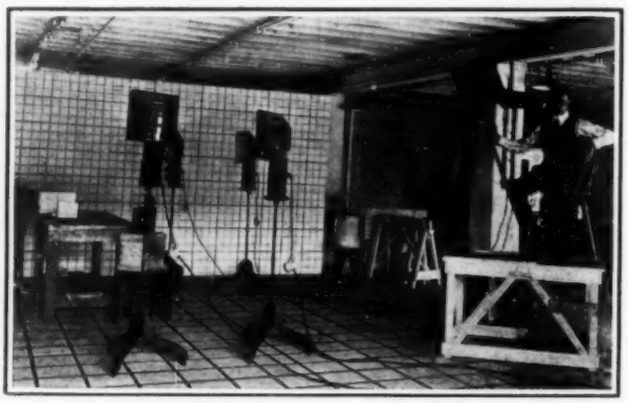


Fig. 23—Equipment of a motion-study laboratory

Various modifications of the motion study apparatus have been made to fit special conditions. Two synchronized cameras operating so that one is making an exposure while the other is changing frames insure complete continuity. Economy is secured by an arrangement that permits a standard strip of film to be used sixteen times, only a small portion being exposed each time. Telephoto lenses have been used in such places as the surgical amphitheater where close photography is out of the question. Arrangements have also been made so that, by remote control of the camera, an observer can record his own motions.

At the present time the apparatus is quite adequate for any motion-study work that has as yet been called for. It is light and easily handled and its manipulation can be learned in a reasonably short time with competent teachers. For those manufacturers who may be interested in going into motion study on their own account it may not be amiss to say that Mrs. Gilbreth is now conducting a small school in motion study work for a few selected students.

It should not be taken from anything that has been said that any one piece of the apparatus described

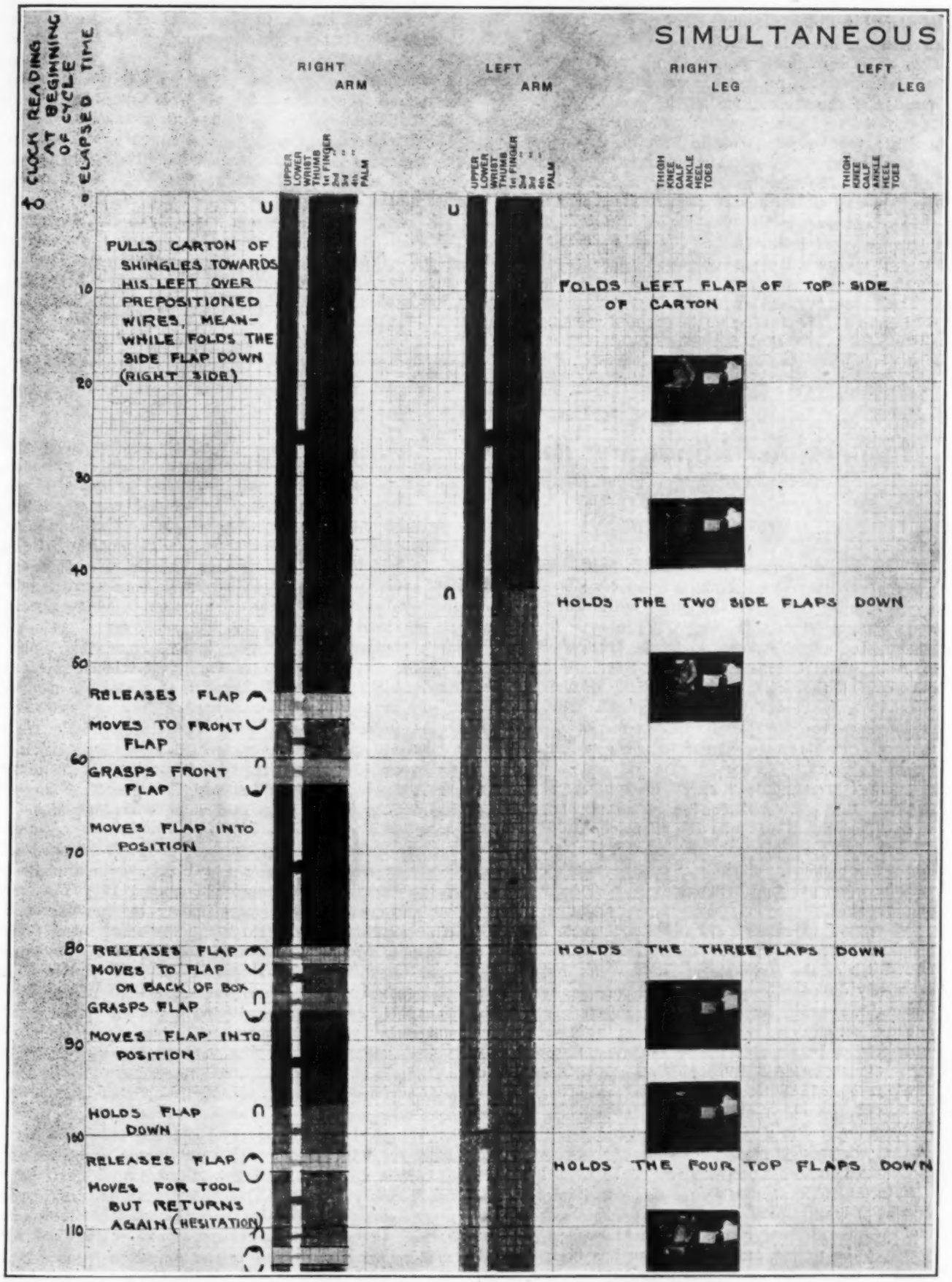


Fig. 24—Simultaneous motion cycle chart. Only a small section is shown and no attempt has been made to reproduce the colors used to designate the various therbligs

has superseded other pieces. In the present highly developed technique each bit of apparatus plays its part and is made to contribute some definite information. The combination of motion picture camera and microchronometer produces a record of the time, the motions of the subject and all the surroundings. Fig. 23 shows a typical motion-study laboratory. The cyclegraph gives an actual outline of the motion of one particular part or physical member. One supplements the other. The magster is simply a device to reduce the handicap of the motion picture film or prints.

The next step is the charting of the data obtained during any particular study. For this purpose a long strip of cross-section paper is used. The lines charted on it make the simultaneous motion cycle chart.

The paper is placed with its longer dimension vertical and on it, beginning at the top and working down, are plotted blocks that represent the durations of the various therbligs, or motion cycle elements, of the different members of the body of which records have been taken. As will be seen in Fig. 24, the motions of the right and left hands, for example, are indicated side by side so that they can be compared. If it is found that one hand is idle while the other is working, a rearrangement of motions may serve to keep both hands busy and reduce the total time considerably, not to mention lessening the effort and fatigue involved.

Distinctive colors have been assigned to the respective therbligs so that the practiced analist can recognize them at a glance without wasting time reading the designating letters.

In this article the attempt has been to give a general picture of the devices invented to simplify the securing of motion-study data. Further details can be obtained from Mr. Gilbreth's books, "Motion Study," and "Applied Motion Study," MacMillan, and from two articles that appeared in the August and September, 1924, issues of *Management and Administration*, that will be included in a new book to be called "Advanced Motion Study."

Inspection of Spot and Butt Welds

By A. L. De Leeuw
Consulting Engineer

THE following remarks on the inspection of welds for quality will be confined to spot welds and butt welds because those are the types with which I have had most experience. The best test I know of for a spot weld is to tear the pieces apart in tension and note carefully where the material tears. Naturally it should not tear at the weld; neither should it tear in the metal directly alongside the weld, for a tear in this region is pretty sure proof that the metal adjacent to the weld has been weakened to some extent by the welding process.

Another worthwhile test is to subject a section through the weld and the surrounding material to a critical examination under the microscope.

These two tests properly applied will lead to a regulation of temperature, timing, voltage and any other variable elements that will result in satisfactory production work.

When two or more spot welds are made simultaneously, some test of the piece should be devised to find which of the simultaneous welds fails first. It is extremely difficult to make the welds of equal strength under these conditions and it is desirable to know which is the weak one.

In testing butt welds allowances must be made for the materials welded. When soft steel is welded to soft steel, a certain percentage of the welds should be broken, some under tension in a testing machine, others by hammer test in a vise. A welded rod held in a vise so that the weld is close to the jaws should not break at the weld under a hammer blow.

It is desirable also to secure occasional microphotographs of longitudinal cross sections through the welds and the adjacent material. Such photographs will show whether the proper amount of flash has been allowed for and whether other variable conditions were right.

During the development of a method of welding new pieces, all of the first lot of pieces welded should be tested to destruction. When a method begins to shape up satisfactorily, it is only necessary to break 10 per cent of the pieces. Later on when the method has reached a more or less permanent stage, it will probably be sufficient to break not more than 1 per cent of the pieces. If the welding process and the operators are kept under proper control, it may be possible to reduce the number of test pieces to be broken below 1 per cent of the total produced. It has been my experience, however, that it is not wise to go beyond this figure.

After a method has been finally established, it often happens that the welds become progressively poorer. In the great majority of cases, the fault is due to the welding electrodes not being kept clean. If the electrodes are clean, however, welded pieces will give off the same kind and amount of sparks. With dirty electrodes the sparks will shoot off at all sorts of angles and with greatly varying intensity. I have occasionally surprised a welding operator by telling him from across a room that his electrodes were dirty. Such a stunt is not at all difficult if you will observe the variation in the direction and intensity of sparks.

When dealing with a part that must equal the solid after welding, an arbitrary standard must be set: for instance, it might be required that the work be stopped when more than 0.5 per cent of the welds fail to pass a given test. No further production should be authorized until the method has been improved to the point where the test requirements can be satisfied.

When mild steel is to be welded to high speed steel or to carbon steel, it is unwise to condemn the welding unless you are absolutely sure that the annealing has been done properly. I have found it advisable to thrust the hot steel immediately into charcoal to keep the air away from it. It is possible that some small amount of carbon may be absorbed by the hot steel but I have never seen it proved. The piece should be transferred to the annealing furnace as quickly as possible. Of course, the ideal arrangement would be to have the welding machine so close to the annealing furnace that the finished welds could be transferred immediately from the welding machine to the furnace but as this is seldom possible owing to shop conditions, it is advisable to have the carbon pack to protect the hot steel.

A paper presented at the annual meeting of the American Welding Society, New York, April 23.

Standardization of Grinding Wheel Shapes and Sizes

Results of the committee on formulation of acceptable standards—Simplification of shapes and sizes by reducing their number to a minimum—Tables of shapes and sizes

THE grinding wheel manufacturers of the United States and Canada, after working for five years in the endeavor to reduce the multitude of existing grinding wheel shapes and sizes to a reasonable number of practical standards, such as would meet all normal requirements of the trade, have prepared a booklet on the standardization and simplification of grinding wheels, containing the final results of their work in the form of tables, listing the adopted standard shapes and sizes for the various classes of work. This booklet is ready to be submitted to the designers and builders of grinding machines and attachments, and the users of grinding wheels, as it is only with their assistance and co-operation that such a movement can attain ultimate success. The tables are given herewith. Copies of the booklet may be obtained from any member of the Grinding Wheel Manufacturers Association.

This same movement toward standardization was started some years prior to the present work, the results being presented in the form of a pamphlet issued in 1916 which received scant recognition, due, no doubt, to the fact that industry in general had not at that time recognized the potential value of such work. Since then, interest in standardization in other lines has increased with rapid strides, stimulated to a great extent by the helpful attitude of the government. A new committee was accordingly appointed in 1920 for the purpose of revising and extending the work previously done in the grinding wheel industry, and having as its aim the formulation of acceptable standards.

The first action was to make a careful survey to ascertain the extent of standardization in other industries. This investigation showed that in the interim of five years, the work had progressed to a very marked degree. Many products, through simplification, had been reduced to a few standards that served the same purpose as the large variety of types and sizes formerly employed. In the case of grinding wheel standardization, many difficulties arose due to the extreme variety of existing types of grinding-machine equipment and each had to be studied with care. Due consideration has been given not only to the machine equipment but to the demand for, service rendered by, composition, shape, manufacture and use of, each type of wheel.

An investigation of the general phases of the problem of wheel standardization, led to the conclusion that the ultimate goal was to simplify wheel shapes and sizes, by reducing their number to a minimum, which would answer the requirements of present grinding practice, and at the same time furnish a sound basis for future development. Engineering practice has found widely diversified methods of accomplishing identical results. This has caused, in the abrasive field,

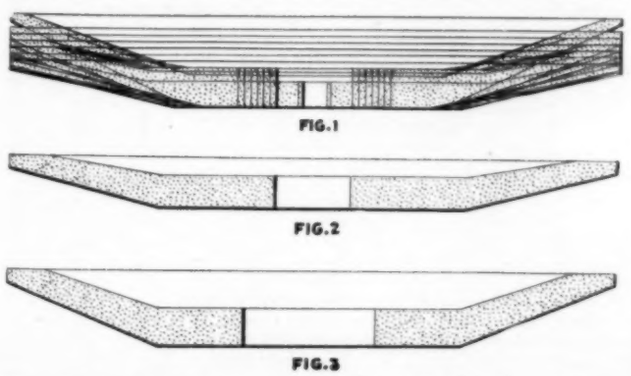


Fig. 1—Layout of a group of 6-in. disk wheels. Figs. 2 and 3—Shapes of disk wheels adopted as standard.

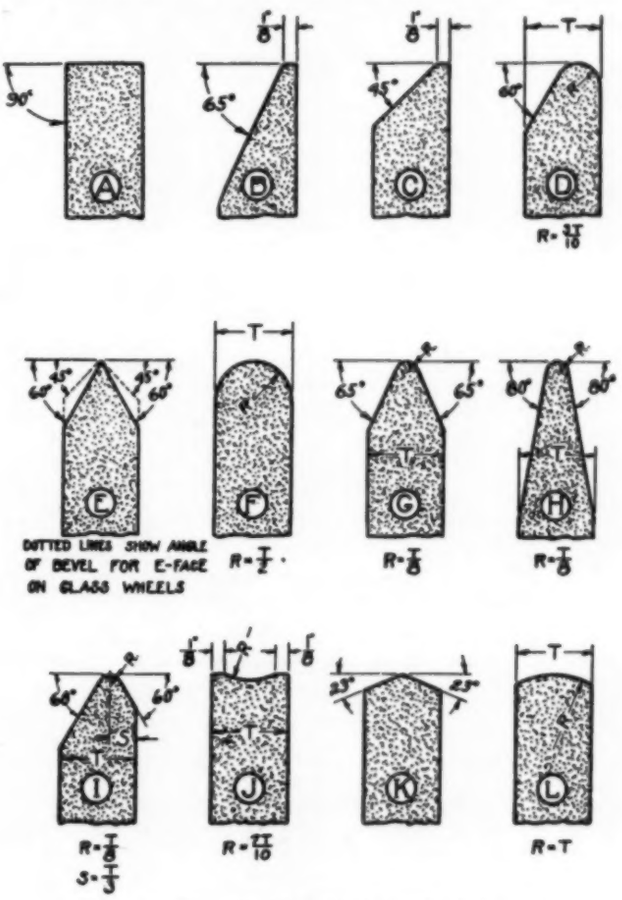
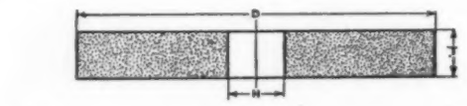
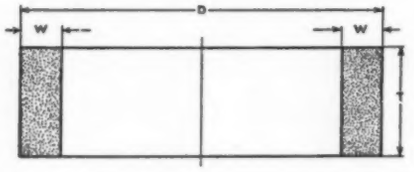


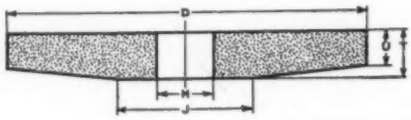
Fig. 4—Shapes of grinding-wheel faces



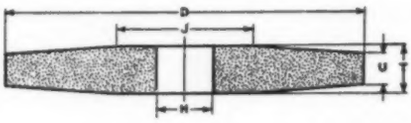
Type No. 1 Straight



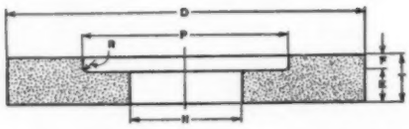
Type No. 2 Cylinder



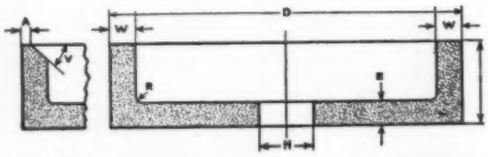
Type No. 3 Tapered One Side



Type No. 4 Tapered Two Sides

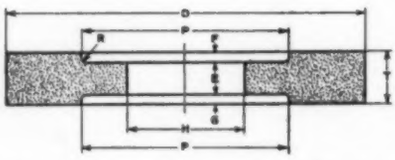


Type No. 5 Recessed One Side

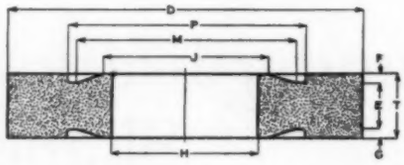


Type No. 6 Straight Cup

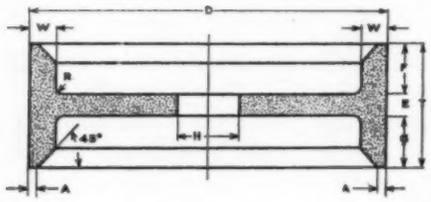
Wheels of this type can be furnished with beveled face



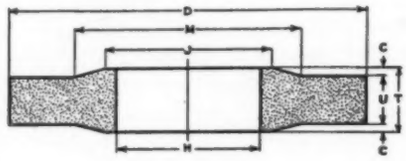
Type No. 7 Recessed Two Sides



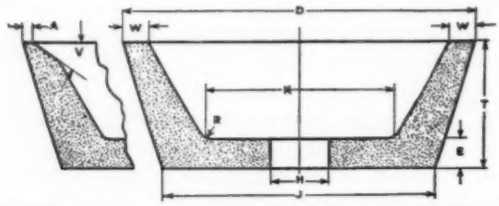
Type No. 8 Countersunk Dovetail



Type No. 9 Double Cup

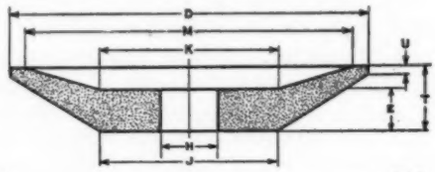


Type No. 10 Raised Dovetail

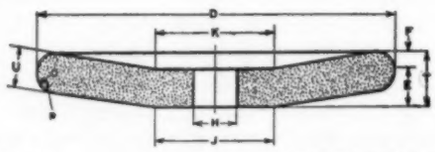


Type No. 11 Flaring Cup

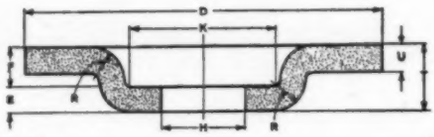
Wheels of this type can be furnished with beveled face



Type No. 12 Dish



Type No. 13 (Saw Gummer) Saucer



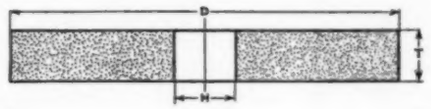
Type No. 14 Offset

KEY TO LETTER DIMENSIONS

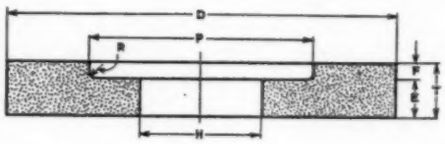
A = Flat Spot of Bevelled Wall.	H = Arbor Hole.	R = Radius.
C = Height of Dovetail.	J = Diameter of Flat or Small Diameter.	T = Thickness (Over All).
D = Diameter (Over All).	K = Diameter of Flat Inside.	U = Width of Face.
E = Center or Back Thickness.	M = Large Diameter of Bevel.	V = Angle of Bevel.
F = Depth of Recess. (See Type 5).	N = Small Diameter of Bevel.	W = Thickness of Wall.
G = Depth of Recess. (See Types 5 and 7).	P = Diameter of Recess.	

Fig. 5—Fourteen adopted types of grinding wheels

Standard Wheels for INTERNAL GRINDING



Type No. 1 Straight



Type No. 5 Recessed One Side

Type	D	T							H*	Recess P	Recess F
1	¼	¼							⅜		
1	⅜	¼	⅜						⅜		
5	⅜	¼							⅜	¼	⅛
1	½	¼							½		
1	½		⅜						⅜		
5	½	¼							⅜	¼	⅛
1	½	¼							¼		
1	½	¼		½					½		
1	⅝		⅜	½					⅝		
5	⅝	¼							⅜	¼	⅛
1	⅝	¼	⅜	⅝					¼		
1	¾										
1	¾	¼	⅜	½	⅝	¾			¼		
5	¾		⅜						¼	⅛	⅛
5	⅜	¼							⅜	¼	⅛
1	⅜	¼	⅜	½					¼		
5	⅜		⅜						¼	⅛	⅛
5	⅜		⅜						⅛	⅛	⅛
5	1	¼							⅜	¼	⅛
1	1	¼	⅜	½	⅝	¾			¼		
1	1	¼	⅜	½	⅝	¾			⅜		
5	1		⅜						¼	⅛	⅛
5	1		⅜						⅛	⅛	⅛
5	1				⅝	¾			⅜	⅝	¼
1	1¼	¼	⅜	½		¾	⅞	1	⅜		
5	1¼		⅜						¼	⅛	⅛
5	1¼		⅜						⅛	⅛	⅛
5	1¼				⅝				⅜	⅝	¼
5	1½		⅜						¼	⅛	⅛
5	1½		⅜						⅛	⅛	⅛
1	1½		⅜	½	⅝	¾			⅜		
5	1½				⅝			1	⅜	⅝	¼
1	1¾			½					⅜		
1	1¾				⅝				⅜		
5	1¾					¾			⅜	1	⅜
1	2	¼							¼		
1	2	¼	⅜	½		¾			⅜		
5	2		⅜						⅛	⅛	⅛
1	2		⅜		⅝	¾			⅜		
5	2				⅝			1	⅜	⅝	¼
5	2					¾			⅜	1¼	¼
1	2½	⅜	½		¾		1		⅜		
5	2½				¾		1		⅜	1¼	¼
5	2½							1¼	⅜	1¾	⅝
5	2¾						1		⅜	1¾	⅜
5	2¾							1¼	⅜	1¾	⅝
5	3				¾				⅜	1⅝	¼
5	3						1		⅜	1⅝	½
5	3							1¼	⅜	2⅛	⅝
5	3½				¾				⅜	1¾	¾
5	3½						1		⅜	1¾	⅝
5	3½							1¼	⅜	1¾	⅝
5	4				¾				⅜	1⅝	¼

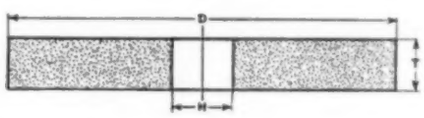
*Arbors are sizes now in use.

Internal Grinding Wheel Standards for NEW INSTALLATIONS

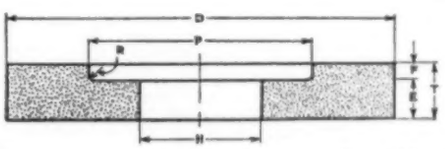
Wheel Diameter	Arbor	Wheel Diameter	Arbor
¼"	⅛	1⅜"	⅜
⅜"	⅛	1¾"	⅜
½"	⅛	2"	⅜
⅝"	⅛	2"	⅜
⅝"	¼	2½"	⅜
¾"	¼	3"	⅜
⅞"	¼	3½"	⅜
1"	¼	4"	⅜
1"	⅜	4"	1¼
1¼"	⅜		

Thicknesses
¼", ⅜", ½", ⅝", ¾", ⅞", 1", 1¼", 1½", 1¾", 2"

Standard Wheels for CYLINDER GRINDING



Type No. 1 Straight

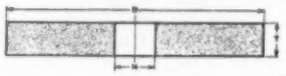


Type No. 5 Recessed One Side

Type	D	T			H		Recess P	Recess F
1	2½	¾	1		⅜			
5	2½	¾			⅜		1¾	⅜
5	2½	¾				1¾	2⅛	¼
1	2¾	¾			⅜			
5	2¾	¾				1¾	2⅛	¼
5	2¾		1		⅜		1¾	⅜
1	3	¾			⅜	1¾		
5	3	¾			⅜		1¾	⅜
5	3		1		⅜		1¾	⅜
5	3	¾				1¾	2⅛	¼
5	3		1			1¾	2⅛	¼
5	3			1¾		1¾	2⅛	½
1	3½	¾			⅜	1¾		
1	3½		1		⅜			
5	3½	¾			⅜		1¾	⅜
5	3½	¾	1			1¾	2⅛	¼
5	3½			1¾		1¾	2⅛	½
1	4	¾				1¾		
5	4	¾			⅜		1¾	⅜
5	4		1			1¾	2⅛	¼
5	4			1¾		1¾	2⅛	½
5	4½	¾			⅜		1¾	⅜
1	4½	¾				1¾		
5	4½	¾				1¾	2⅛	¼
5	4½		1			1¾	2⅛	¼

Fig. 6—Standard forms of wheels for internal and cylinder grinding

Standard Straight Wheels for CYLINDRICAL GRINDING



Type No. 1 — Straight

D	T	H
10	As ordered	5
12		5
14		5
16		5
18		5
18		8
20		5
20		8
20		12
24		5
24		8
24		12
26		12

Standard Single Recess Wheels for CYLINDRICAL GRINDING

Type No. 5 — Recessed One Side

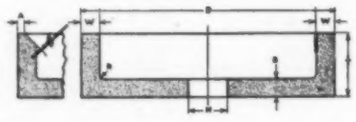
D	T	H	P
10	As ordered	5	6½
12		5	6½
14		5	8
16		5	8
18		5	8½
18		8	11
20		5	10½
20		8	11
24		5	10½
24		8	11

Standard CUTTING-OFF WHEELS

Type No. 1 — Straight

D	T	H
6	⅛	As ordered
6		¼
7	⅛	
7		¼
8	⅛	
8		¼
12	⅛	
12		¼

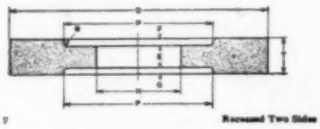
Standard Straight Cup Wheels for TOOL ROOM GRINDING



Type No. 6 — Straight Cup

Straight Face						Bevel Face	
D	T	H	W	E	R	A	V
2½	1½	As ordered	½	½	⅛	½	30°
3	1½		½	½	⅛	½	30°
3½	1½		½	½	⅛	½	30°
4	1½		½	½	⅛	½	30°
5	1½		½	½	⅛	½	30°

Standard Double Recess Wheels for CYLINDRICAL GRINDING



Type No. 7 — Recessed Two Sides

D	T	H	P
14	As ordered	5	8
16		5	8
18		8	11
20		8	11
20		12	14½
24		8	11
24		12	14½
26		12	14½

Depth of Recess for 8" and 12" Hole

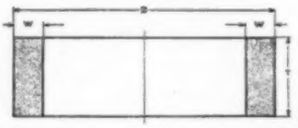
T	F	G
With "T" less than 2"	0	0
With "T" from 2" up to 2½ inclusive	⅛"	⅛"
With "T" 3" and larger	½"	½"

Standard Straight Wheels with Large Holes for TOOL GRINDING

Type No. 1 — Straight

D	T	H
14	As ordered	5
20		9
24		10
26		12
36		24

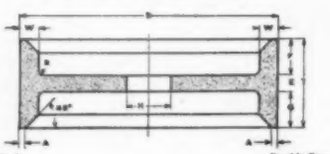
Standard CYLINDER WHEELS



Type No. 3 — Cylinder

D	T	W
8	4	1
10	4	1
12	4	1½
14	4	1½
16	4	2
18	6	2
20	6	2½
24	6	2½
30	6	3

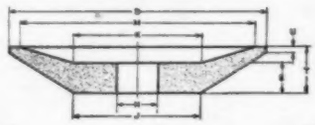
Standard DOUBLE CUP WHEEL



Type No. 9 — Double Cup

D	T	H	W	E	A
6	2	As ordered	¼	¼	⅛

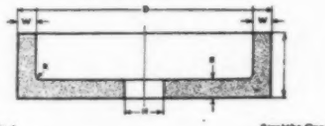
Standard DISH WHEELS



Type No. 12 — Dish

D	T	H	E	K and J	U	M
3	½	As ordered	⅛	1½	⅛	2¾
3½	½		⅛	1¾	⅛	3¼
4	½		⅛	2	⅛	3¾
4½	½		⅛	2¼	1/16	4
5	½		⅛	2½	1/16	4¾
6	½		⅛	3	1/16	5¾
6	¾		⅜	3	1/16	5¾
8	¾		½	4	1/16	7
8	1		½	4	1/16	7

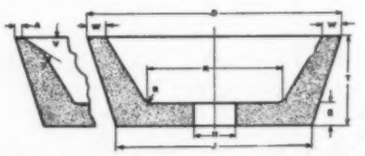
Standard Straight Cup Wheels for GENERAL USE



Type No. 6 — Straight Cup

D	T	H	W	E
8	4	As ordered	1	1
10	4		1¼	1¼
12	4		1½	1½
14	4		1½	1½
16	5		2	2
20	6		2	2
24	6		2½	2½
30	8		2½	2½

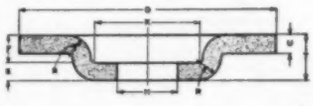
Standard FLARING CUP WHEELS



Type No. 11 — Flaring Cup

Straight Face								Bevel Face	
D	T	H	W	E	J	K	R	A	V
3	1¾	As ordered	⅜	⅜	2¼	1¼	⅛	1/16	30°
3½	1¾		⅜	⅜	2¼	1½	⅛	1/16	30°
3½	1½		⅜	⅜	2¼	1½	⅛	1/16	30°
4	1½		⅜	⅜	3	2¼	⅛	1/16	30°
4½	2		⅜	⅜	3½	3	⅛	1/16	30°
5	1¾		⅜	⅝	3½	3	⅛	1/16	30°
6	2		⅜	½	4½	3¾	⅛	1/16	30°
7	2		⅜	½	5	3¾	⅛		

Standard OFFSET WHEELS



Type No. 14 — Offset

D	T	H	U	E	K	R
10	1	3	⅝	⅝	4	⅜
12	1½	3	½	½	4¾	½

Fig. 7—Standard forms of wheels for various uses

as in others, variations which reflect only the numberless points of view in approaching a specific problem. The variations in size, shape and arbor hole have little bearing on the basic engineering principles involved. As a result, thousands of wheel shapes have been developed because the industry as a whole had never taken steps to establish standards for the guidance of designers, machine builders and users, but had accepted without question wheel designs as ordered.

There were several sound reasons for the existence of this condition. Among the foremost was the rapid development of grinding machines, opening new fields for the application and use of grinding wheels. A

Diameter in Inches	Thickness of Wheel in Inches																		
	½	⅝	¾	⅞	1	1¼	1½	1¾	2	2½	2½	2¾	3	3½	3½	4	4½	5
6	½	½	½	½	½	⅝	⅝	¾	¾	¾	¾	¾	¾	¾	¾	1	1	1
7	½	½	½	½	⅝	⅝	¾	¾	¾	¾	¾	¾	1	1	1	1	1	1
8	⅝	⅝	⅝	⅝	⅝	¾	¾	¾	1	1	1	1	1	1	1	1½	1½	1½
9	⅝	⅝	⅝	¾	¾	¾	¾	1	1	1	1	1	1½	1½	1½	1½	1½	1½
10	¾	¾	¾	¾	¾	¾	¾	1	1	1	1½	1½	1½	1½	1½	1½	1½	1½
12	¾	¾	¾	¾	1	1	1	1	1	1	1½	1½	1½	1½	1½	1½	1½	1½
14	⅞	⅞	⅞	⅞	1	1	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
16					1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
18					1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
20						1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
24						1½	1½	1½	1½	1½	1½	1½	2	2	2	2	2	
26							1½	1½	1½	1½	1½	2	2	2	2	2½	2½	2½
30								1½	1½	2	2	2	2	2½	2½	2½	2½	2½
36									2	2½	2½	2½	2½	2½	2½	2½	3	3

No user of wheels should operate on any machine of given spindle diameter a wheel of larger diameter or greater thickness than specified in the following table.

Fig. 8—Table showing sizes of machine spindles

further cause can be charged to the lack of co-operation between the machine designer and grinding-wheel manufacturer, as well as the lack of standardization within the ranks of the machine builders themselves.

A complete list of existing sizes of each given type of wheel was compiled. These various wheels were checked against each other by a layout-plan where sizes of a given diameter and similar shape were drawn one over the other. For example, Fig. 1, represents a layout of a group of 6-in. dish wheels, all designed for cutter and reamer work, so similar that any one of these could, with the proper arbor, be substituted for the other. This is indicative of all types of toolroom wheels and shows clearly what simplification of wheel shapes mean to the industry. There were no less than twenty-two 6-in. dish wheels to consider. This number was finally reduced to the two standards shown in Figs. 2 and 3. By this method, the committee could visualize quickly the differences in dimensions and shapes. By the elimination of inactive sizes (arrived at from the actual sales records of a number of manufacturers) only the popular selling sizes were left to be considered. From these a composite shape was designed, which should meet the present day machine requirements, and satisfy the grinding wheel manufacturers. In this way internal wheels, dish wheels, straight wheels, flaring cups and double cups were simplified. In no case was the thickness of wheels between flanges increased in the types of wheels just mentioned.

The first types to receive attention were the internal and cylinder grinding wheels. The troubles encountered were many, because of the varying sizes controlled by the diameter of the holes to be ground and the arbor holes for the various internal-production machines and internal attachments. With the co-operation, assistance and advice of the builders of internal- and cylinder-grinding machines, the committee after three years of work succeeded in having the present list of diameters and thicknesses approved. The following internal and cylinder grinding wheel dimensions were adopted:

STANDARD DIAMETERS OF INTERNAL WHEELS
(shown in inches)

¼, ⅜, 7/16, ½, 9/16, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾, 2, 2½, 2¾, 3, 3½, 4.

STANDARD THICKNESSES OF INTERNAL WHEELS
(shown in inches)

¼, ⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾, 2.

CYLINDER GRINDING WHEELS
(Dimensions shown in inches)

Diameters, 2½, 2¾, 3, 3½, 4, 4½.
Thicknesses ¾, 1, 1¼.
Arbors, ⅝, 1¼.
Recess, 1⅝x¼ for ⅝ hole. 2¼x¼ for 1¼ hole.

The table below is a summary of the committee's work on internal, cylinder grinding and toolroom wheels, showing existing sizes, reduction and possible stock saving. It is based on the lowest possible stock quantities for each type of wheel.

Internal and cylinder grinding wheels: 500 in each size, in two grits and two grades.

Straight, flaring and double cups: 100 in each size, in two grits and two grades.

Dish wheels: 200 in each size, in two grits and two grades.

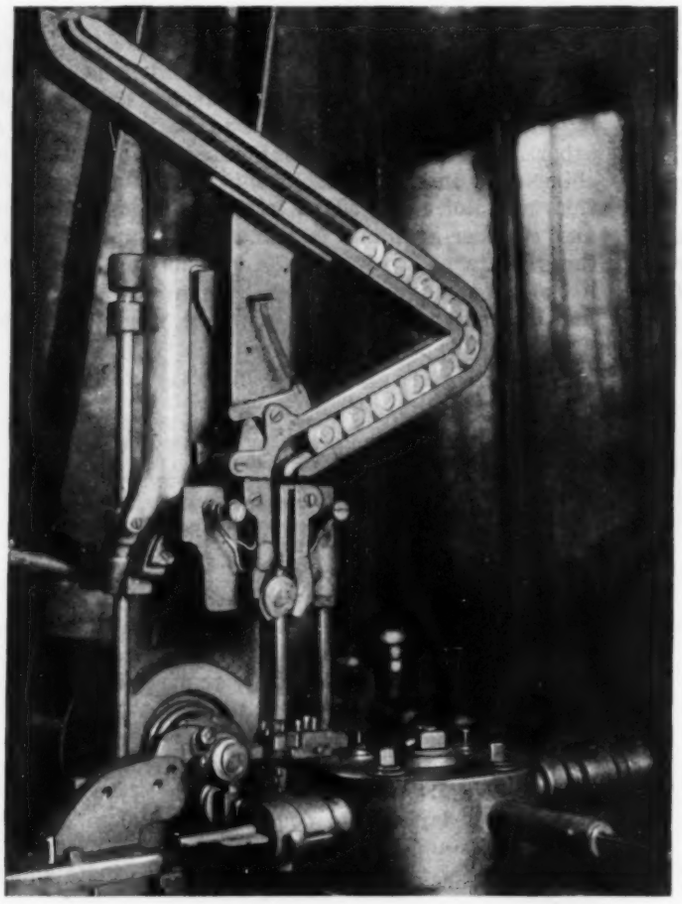
Type of Wheel	Number of Existing Shapes	Possible Stock	Reduced to	Reduced Stock	Possible Stock Saving
Internal	289	578,000	95	190,000	388,000
Cylinder	45	90,000	26	52,000	38,000
Straight Cups	11	4,400	5	2,000	2,400
Flaring Cups	27	10,800	8	3,200	6,600
Dish Wheels	38	30,400	9	7,200	23,200
Double Cups	4	1,600	1	400	1,200

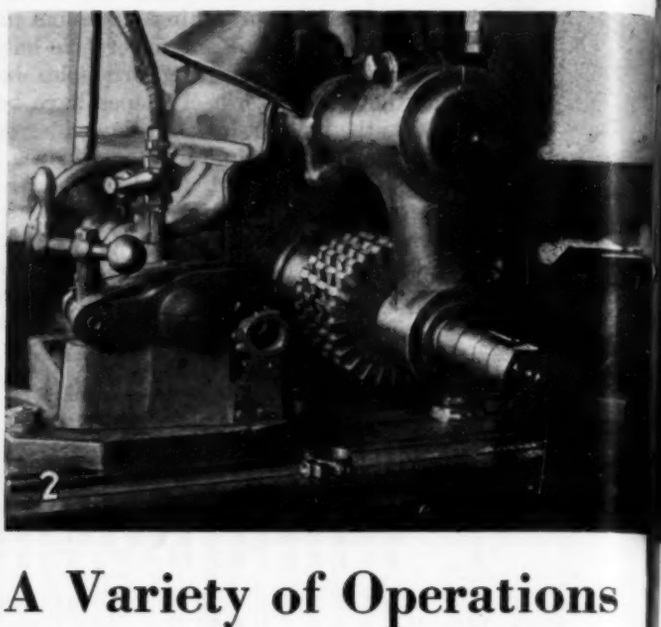
Total reduction by simplification: 459,400 wheels.

Cylindrical grinding wheels were the last to be considered. Many different wheel sleeves had been designed, necessitating a large number of arbor holes and different counterbores. Close co-operation by some of the leading manufacturers of cylindrical-grinding machines made it possible to standardize on three arbor holes, namely 5 in., 8 in. and 12 in. It was possible to make the diameter and depth of counterbore standard for all cylindrical grinding wheels having a thickness greater than 2 inches.

One other step toward standardization was to reduce the types and shapes of all classes of wheels from twenty-nine to fourteen. The types adopted are shown in Fig. 5, properly numbered. The key to the dimension letters enables the users to accurately order the type required. This classification greatly simplifies the stock of wheels wherever a quantity is kept on hand. The shapes of grinding-wheel faces are shown in Fig. 4.

The tables shown in Figs. 6, 7 and 8 are the result of the committee's work and represent standard types and shapes of wheels recently adopted by the Grinding Wheel Manufacturers' Association of the United States and Canada.





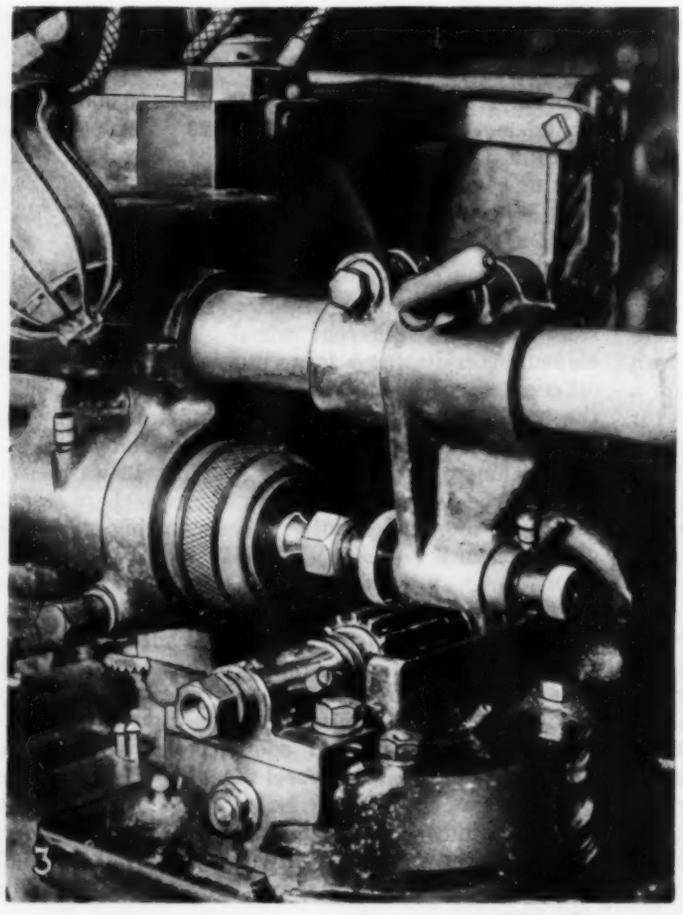
A Variety of Operations of Sewing

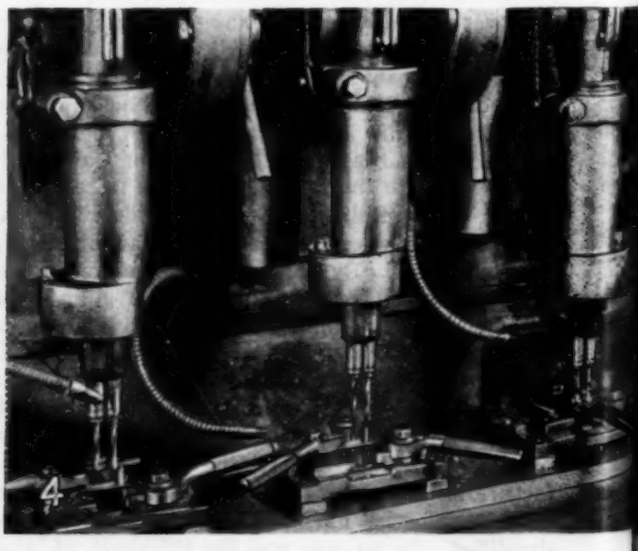
Fig. 1—A preliminary operation on thread takeup eccentric. By special gooseneck loading mechanism this operation is fully automatic. Front and rear tool blocks carry tools for facing sides, forming outside diameter and cutting 0.09-in. groove ½ in. deep. Turret tools finish 0.526-in. hole through hub

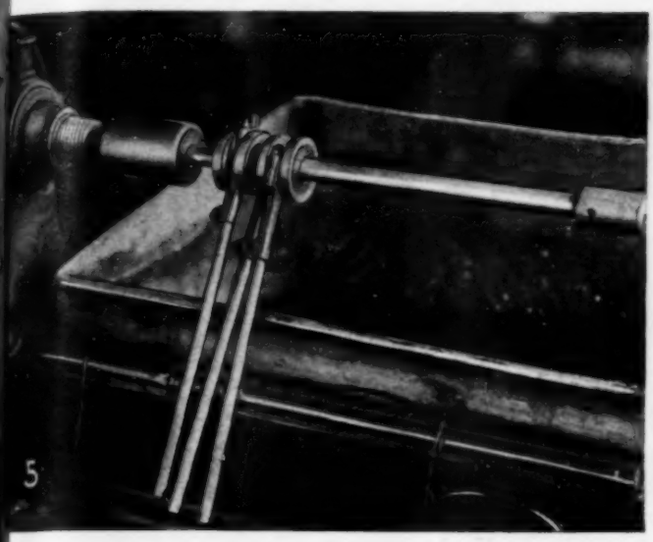
Fig. 2—Straddle milling sides of needle-lever strap blank. Two fixtures are used, each holding two pieces. The table feed is automatic, making production 200 pieces per hour

Fig. 3—Cutting teeth on feed cups having 280 teeth and a pitch diameter of 1.9311 in. With a 15-lead, 15-gashed hob, the time is eight minutes per piece

Fig. 4—Needle-bar link being drilled in three-spindle drilling machine with multi-







Used in the Manufacture Machine Parts

ple-head attachments. One operator completes 176 pieces per hour

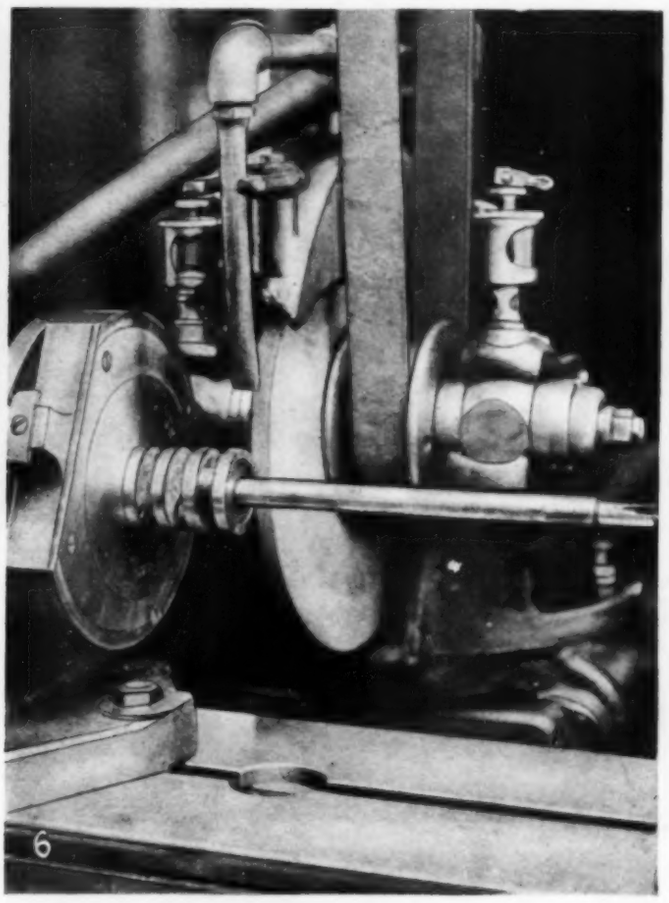
Fig. 5—Rough lapping crankshaft to fit shaft pins. A finish-lapping operation is accomplished in the machine at assembly to insure a perfect bearing

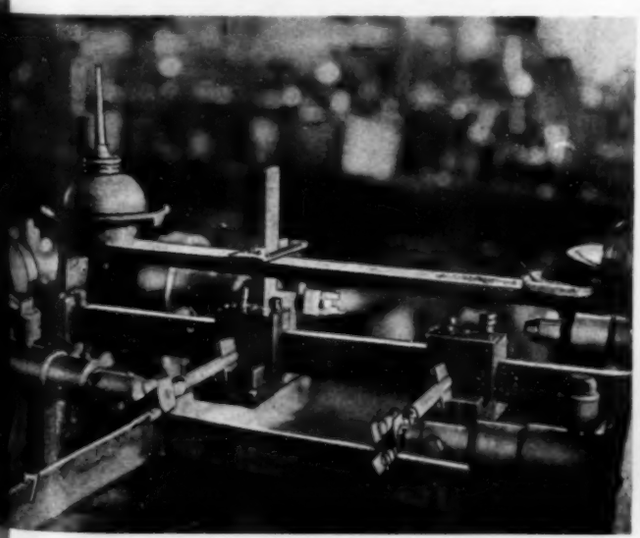
Fig. 6—Finish grinding crank-pin bearings. A special fixture indexes the work for grinding three off-set crank pins

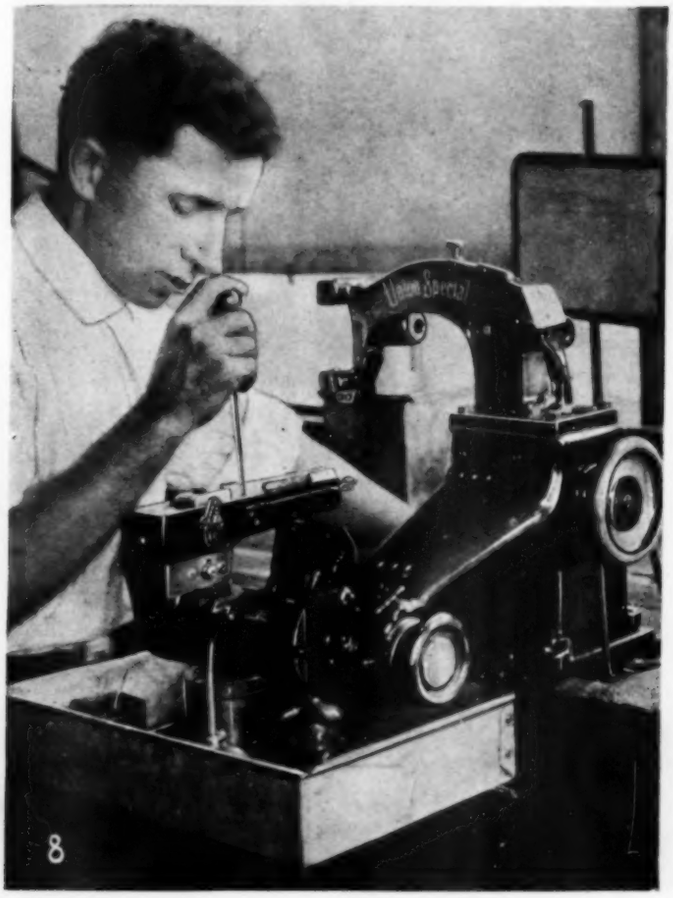
Fig. 7—Lapping ball and socket joint, using oil and pumice stone. Work is oscillated at 120 turns per min. and 0.0001 in. to 0.00025 in. of stock is removed

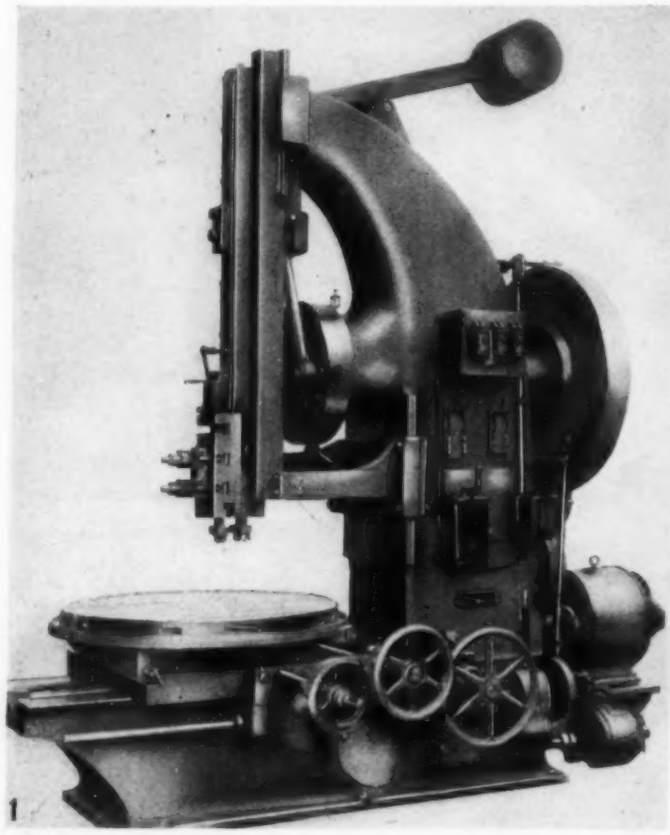
Fig. 8—Adjusting feed bar at assembly, one of many final adjustments necessary

Photographs by courtesy of the Union Special Machine Co., Chicago, Ill.









Modern Methods of Mounting Motors

1—Sellers slotter—two motors

2—Barnes Drill Co.—vertical drill

3—Toledo punch press

4—Foster Machine Co.—lathe

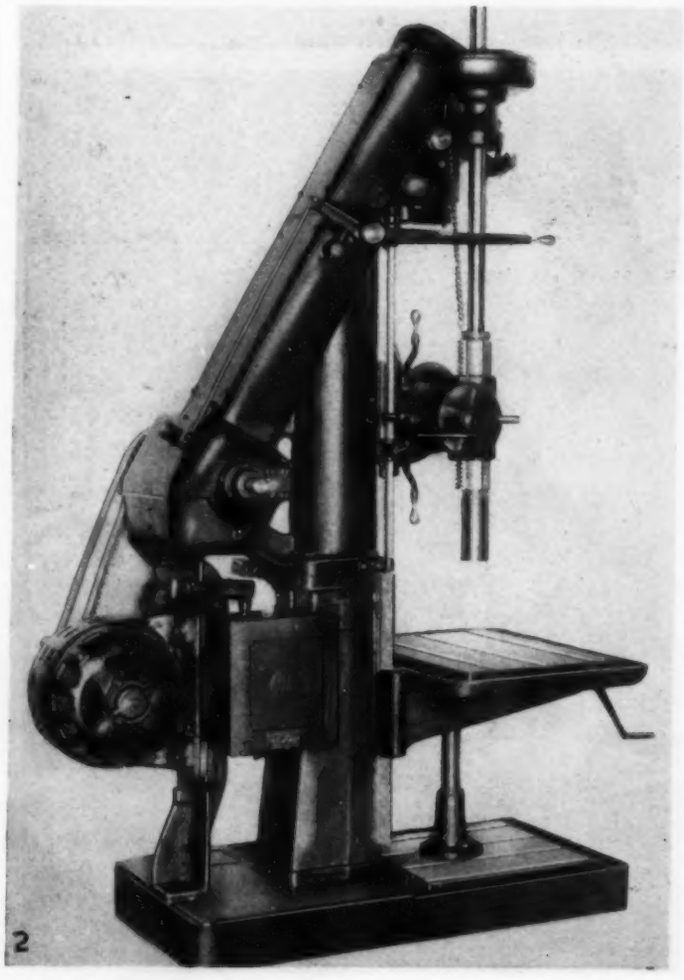
5—Rockford milling machine

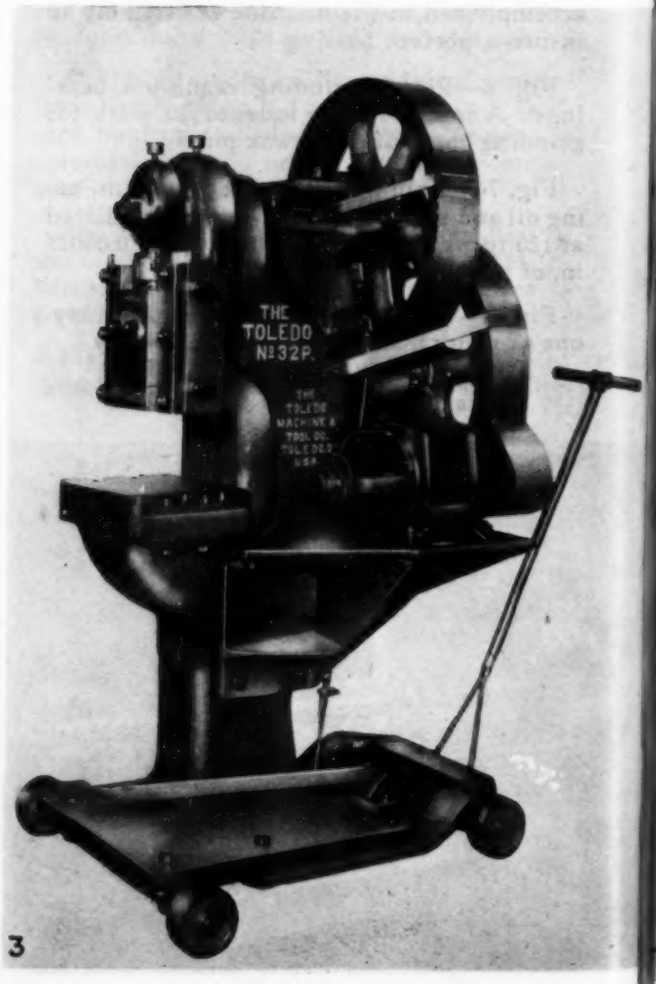
6—Brown & Sharpe milling machine

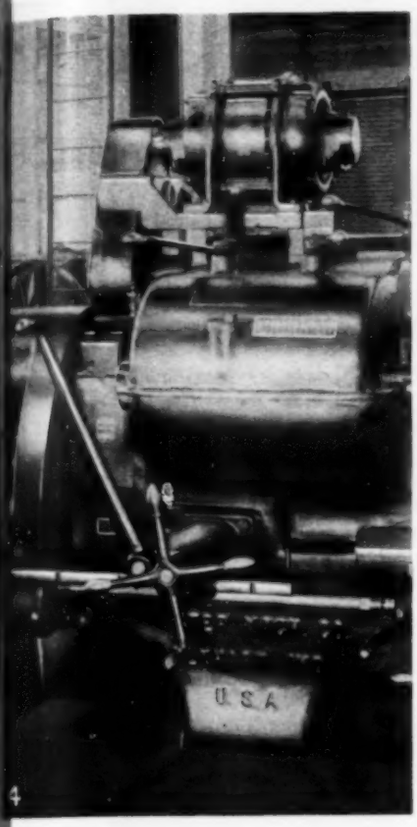
7—Rivett grinder—two motors

8—Cincinnati boring mill

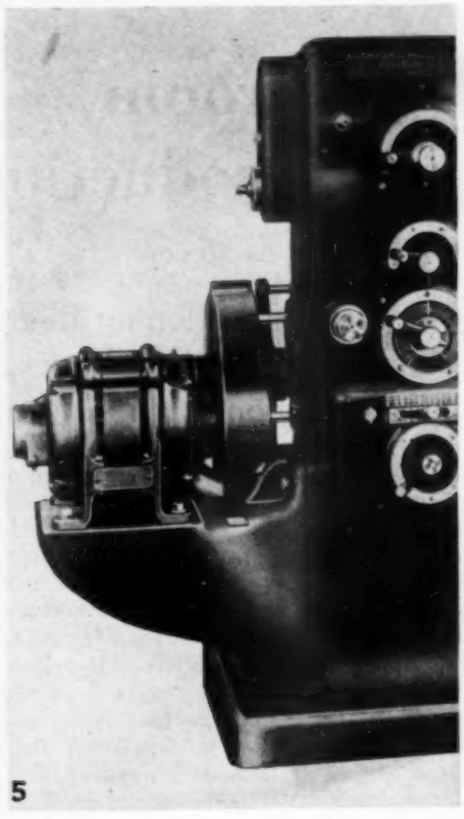
9—Landis Tool Co.—grinder

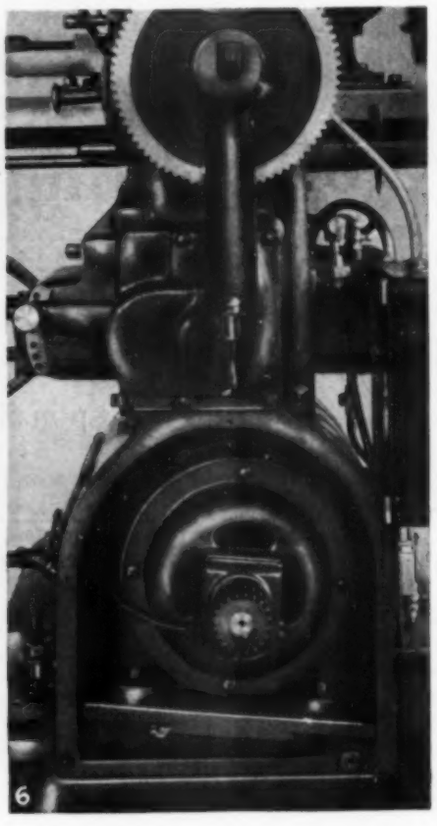


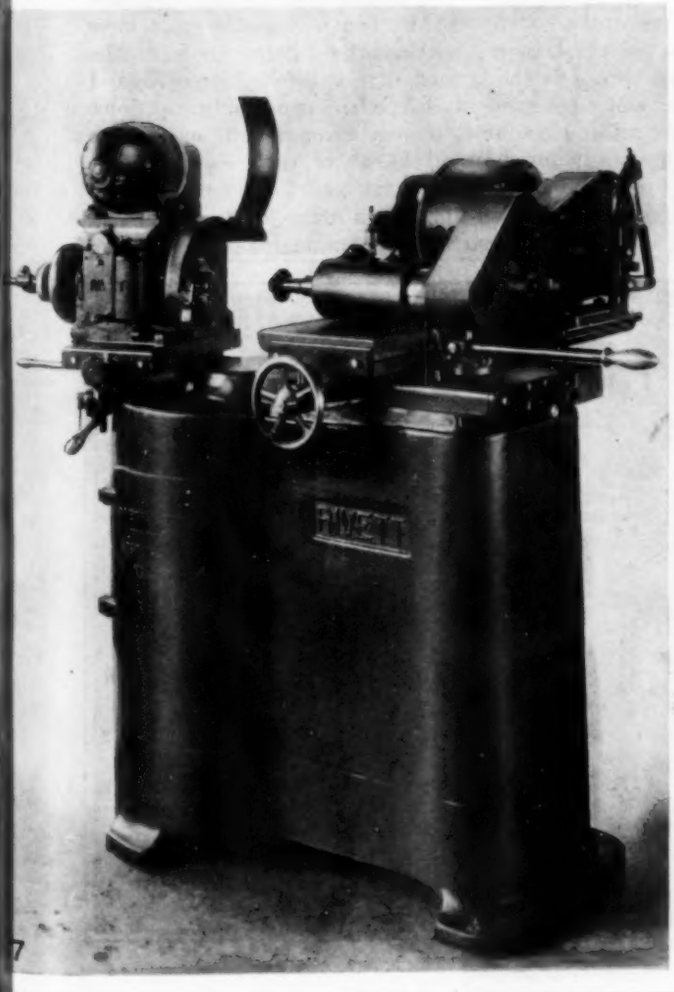




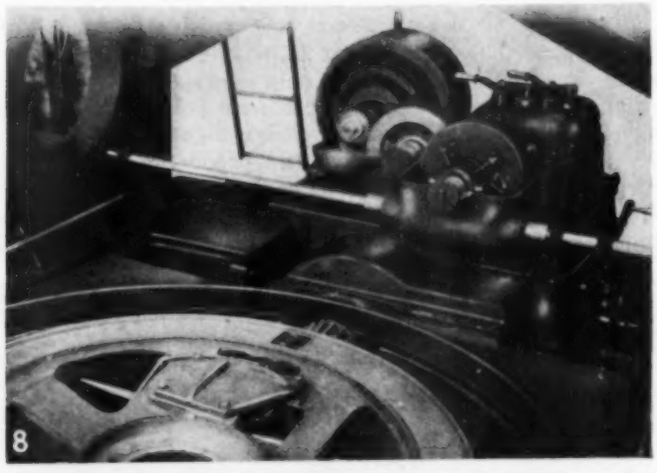
4

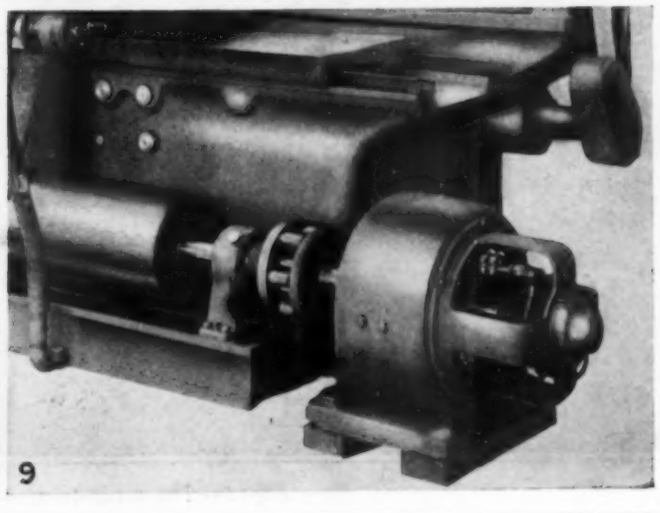

5


6



7


8


9

A Toolroom Operating on a Production Basis

By Arthur A. Merry

The small-quantity problem—Developing all-around toolmakers from specialists—Scheduling work and establishing responsibility—Functions of the control board

A TOOLROOM that is managed and operated with the same degree of thought and efficiency as a production department is, ceases to be an evil and becomes a real asset to any company. If the men in charge will look at this department as one that is expected to make money, the same as a producing department, and follow up the tools they make to know their cost and what has been saved over previous methods, they can at once put it on a paying basis. When facts can be used to operate the tool room, the management will see the department, which it has often regarded as an expense, in its true light.

There is no reason for attaching any mystery to the making of fine precision tools. Their building presents problems no different from any which thousands of shops have that are building an article, more or less special, in small quantities. It only means careful attention to an efficient system for handling parts in the smaller quantities. It requires close watch of the details and assistants who have the production man's viewpoint of getting things done on schedule.

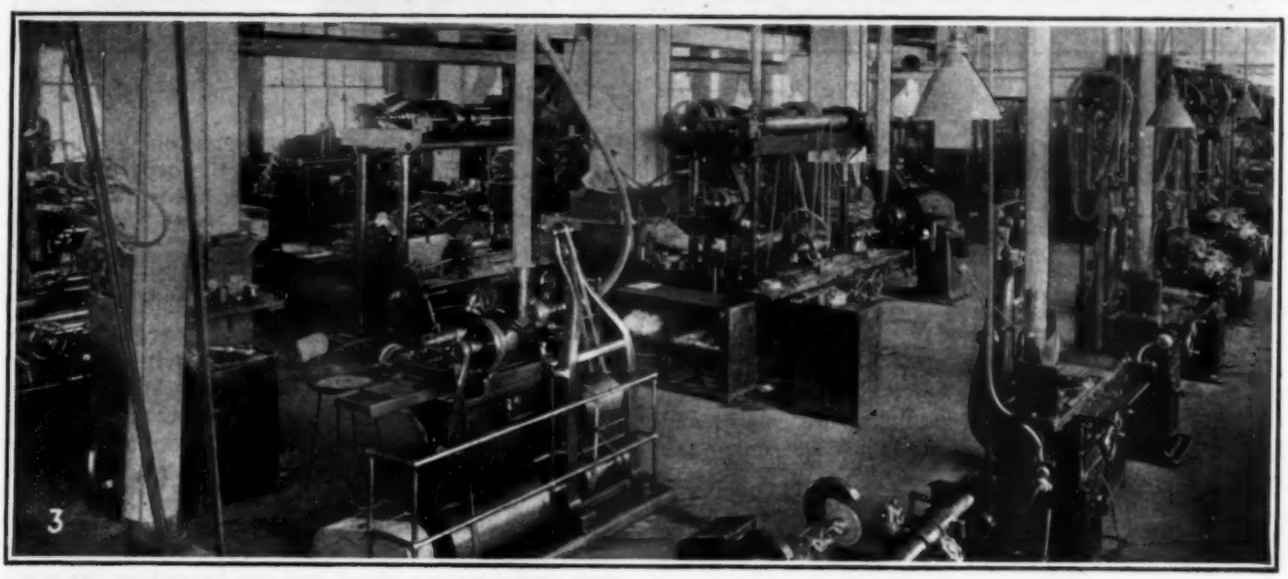
The small number of first-class, all-round toolmakers who are required in a tool room run on a production basis is quite an item of saving in itself, and as these men are getting scarcer, it behooves every shop to plan for the day when the old-time toolmaker will be no more.

I will outline in this article the methods employed in building special tools at the Erie Works of the General Electric Company, to make the point clear.

A word first as to the layout of the toolroom will make it easier to follow the system which took several years to perfect. I want to emphasize the fact that the final plan is not a theoretical one that looks good only on paper, but one that has worked efficiently for the past six years.

The department is located in three bays in one of the main buildings. The center bay is the only one having crane service, so the heavy machine tools have been grouped there, putting the lighter tools in the other two. As the accompanying illustrations, Figs. 1 to 5, will show, the machines are grouped in sections, lathe, milling machine, shaper, grinder and bench, with an assistant foreman in charge of each section. The machines, in practically every case, are operated by specialists in a given line which many, on first thought, will say is wrong, that it is not conducive to the making

Fig. 1—The main toolroom bay facing south



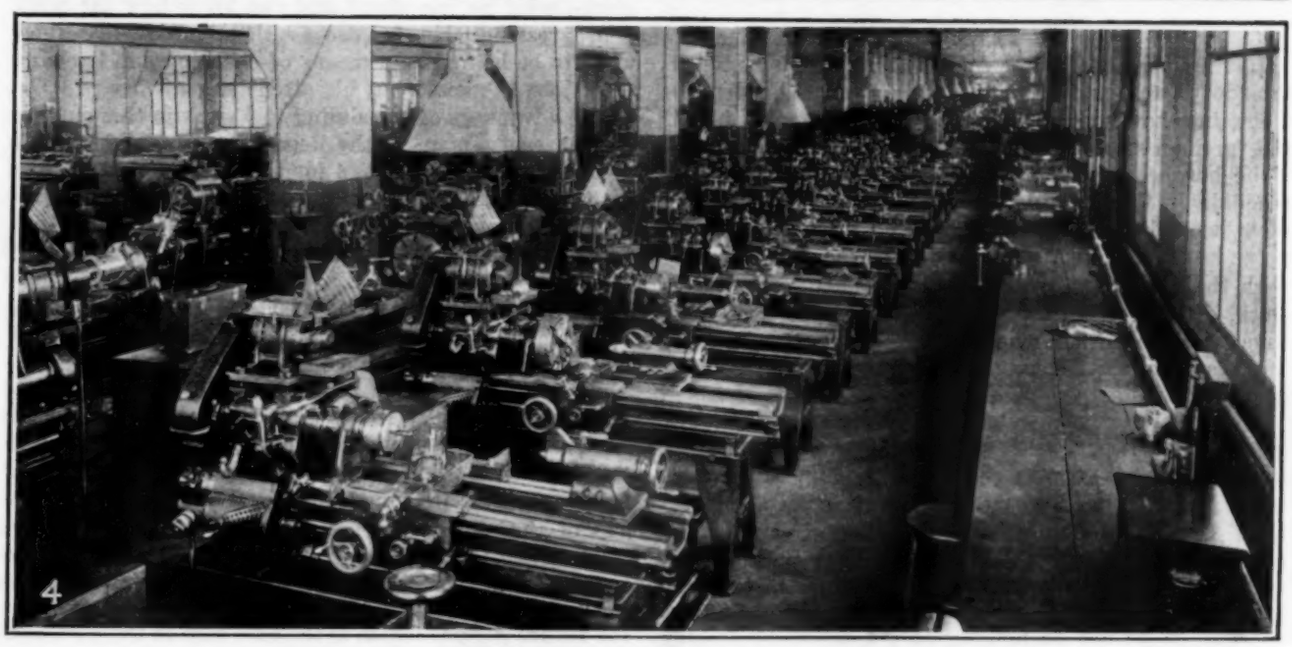


Fig. 2—The shaper and milling machine sections. Fig. 3—A view in the grinding machine section. Fig. 4—There is very little unused space in the lathe section

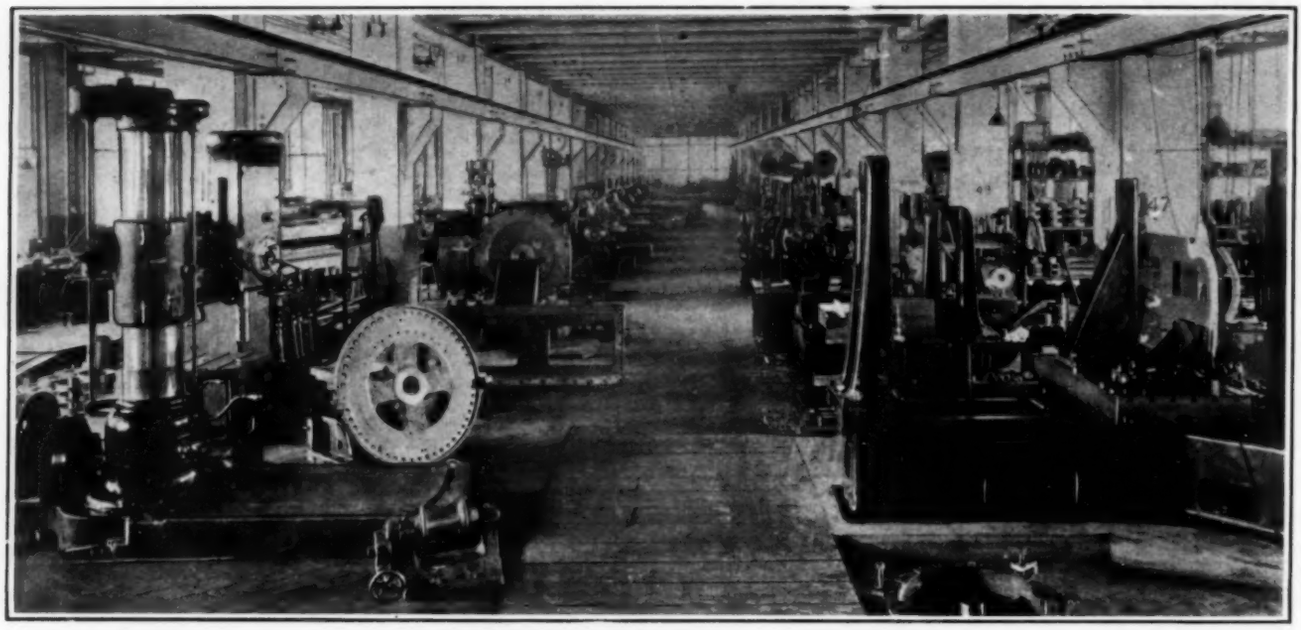


Fig. 5—The main bay looking north

of all-around men. Quite to the contrary, it is just the thing that does, for after a man has operated a machine for six or eight months and expresses a desire to run some other kind, he is given that opportunity, providing he has shown by his work that he holds promise of all-around development. It is money well spent in allowing him to learn another type of machine. He is kept at this work until he has demonstrated that he is proficient in it before he is given another change. Some of the very best men in the department are those who have been through the "mill," as we call it, and have demonstrated that they are capable of doing the better class of work.

In order to make the working of the department clear, a job is followed from the time it is received from the tool-design department until it is completed.

Scheduling the Work

Having previously determined from the department the tool is for, and from the main production department, just how soon they must have the completed tool, the foreman studies the job with the date in mind, and if he has been given time enough to make it, he will schedule it through the toolroom. In order to complete it on time it must be started on time, so from his notes he arrives at a starting date. These data, along with the blueprints, are then turned over to the stock clerk. His duty is to see that all of the patterns, castings, steel and other materials are ordered and in the hands of the section assistants by the time the job is scheduled to start.

No one man, alone, watches the progress of the work through the department; everyone concerned does, as each assistant is crowding the other fellow for his part, so he will not be responsible for any delay along the line. For example, the bench man in most cases is the last man to work on the sequence of operations. If he sees that the parts are not coming to him in time, he goes to the section which is running behind to find the reason. If he can do nothing to get action by talking with his fellow assistant, he then goes to the foreman and reports his difficulty. If, when the latter looks into the matter, he finds the delay to be unavoidable, he will ask for an extension of time from the department the tool is for and re-schedules the work in his own department. He then makes it a point to see that there is no further delay.

The Department Control Boards

In the office there are two control boards for shop-order cards. These boards are built with thirty-one vertical and nine horizontal rows of pockets in which to schedule complete jobs. The average number of these jobs shipped over a period of a year prior to the inauguration of the plan amounted to an average of nine per day.

The final inspector removes the cards from the board when the job is shipped, so the foreman can see at a glance what he has ahead and can know how the work is progressing. He can also use those cards which show work to be behind as a means of checking and knowing what jobs he should put his attention on.

The advantage of scheduling tool work in this manner is that every man in the department is held strictly accountable to the foreman for the keeping of the promise that the foreman makes, being given at the same time ample opportunity to object if he sees that he is going to fall behind for reasons beyond his personal control.

Another advantage of this system is that when the toolroom is being loaded beyond its capacity, the fact will be indicated on the control boards, and the necessary arrangements can be made to get tools manufactured on the outside, to hire more men for the department or to work overtime. The entire system is laid out to catch a thing before it happens, not afterwards. Fundamentally, it is applicable in any toolroom regardless of the nature of the work.

The fact that the control boards will indicate the trend of business in the tool room makes them applicable for forecasting the department labor expenses for future periods which is the first step in the direction of budgeting all activities, an end to be desired from the management's standpoint.

Automotive Production

Is Your Inspection Policy Preventive Or Corrective?

By John Younger
Associate Editor, *American Machinist*

Modern inspection methods practiced in automotive shops—Co-operation between inspectors and operators—Control of inspection departments—Consideration of sales department

INSPECTION is rarely looked upon as a constructive force, but perhaps too often it is considered destructive. Many production men believe that inspection is responsible for the stopping of material that would otherwise have gone through satisfactorily.

Inspection is distinctly constructive, not only in its every-day work in the factory or shop, but also in its share of accomplishments toward standardization and interchangeability. The development in the science and art of inspection has been as rapid as any other advance in production methods. It is 25 years ago that a pin was dimensioned 2 in. and the hole into which it was to fit, was likewise dimensioned 2 in. The inspector, working in co-operation with the production man, demanded of the engineer that he express his idea of running clearances in actual dimensions. It was also the inspector who found that various men had their own personal ideas as to what 2 in. really meant, and that various machines interpreted such sizes differently; so there grew up a demand for the specification that should be allowed for the human and mechanical elements. Study of these factors has brought the present-day development of standardization and interchangeability, which in turn has brought about lowered costs.

Working Tolerances

The reduction of manufacturing costs is the primary reason for interchangeability. It is practically impossible to produce a number of parts of a given design with absolute uniformity, as variations are bound to exist. Keeping limits to a minimum, so that one part fits another having equal limits, furnishes a fundamental point in interchangeable manufacture. To accomplish this, gages and instruments of various types are used, for, unless such limits as are determined for proper functioning are held, the unit will be unsatisfactory.

There are many factors to consider in setting tolerances for various classes of work, so that it is impossible to give rules that would apply universally. It is necessary to determine, through practical experience, the limits best suited for a given piece of work, and good results will then depend upon the inspection methods.

The greater the limits can be made, without reducing the quality of the product to be manufactured, the lower will be the cost to produce. It is unnecessary and expensive to hold close limits on unimportant parts. Many manufacturers have established their own limit systems with the result that lower costs are possible, less scrap is produced and a better product is made turned out.

The automobile industry is the greatest exponent of the value of inspection. An automotive blueprint usually has complete instructions, such as the material to be used for a given part, its rough condition, the machining dimensions, the proper allowances for clearances and the tolerances for the personal equation. The inspector uses this print as his guide and accordingly accepts or rejects material as it agrees or disagrees.

Inspection Methods

Inspectors have usually worked under the direction of the chief engineer whose methods were entirely devoted to checking the accuracy of a finished job. An inspection department was located in the central part of the factory, receiving work in its various stages. After the completion of a certain operation on a batch of work, the work was conveyed to this department for inspection and in turn routed to the next operation or to the stores.

This procedure is being displaced by a more rational system because it is wasteful in three ways. First, because a quantity of work is completed before determining its accuracy, thus causing the loss of many pieces that might have been saved. Secondly, it requires excessive handling of material by tote-boxes and trucks. In large plants such traffic to and from the inspection department would resemble the traffic condi-

AUTOMOTIVE PRODUCTION

tions in our large congested cities. Finally, it is wasteful because of the cost of the unfinished material awaiting inspection.

Scrutiny of these three sources of waste developed the modern method of inspection, practiced in leading automobile factories in which inspection becomes a preventive rather than a remedy and the inspector becomes a production man instead of the director of a material-handling station. Transportation of the work is reduced to a minimum, due to the inspector taking his station in the line of operations.

The inspector has been released from the control of the engineer, and lies nearer to the men who actually do the work. It is recognized that quality starts with the man at the machine, therefore the inspector should be near to insure standards of quality before work is started.

It is no longer necessary to wait for a complete batch to be finished. The inspector now takes the first sample produced by a machine and carefully inspects it to make sure that succeeding parts will be satisfactory. In some shops, such a prevention policy is carried out to the extent of checking the tool set-up and inspecting all gages and fixtures thoroughly before work is started. In the Chrysler plant, for example, micrometers are delivered to the tool inspector at night, checked with the Johansson gages, properly adjusted if necessary, and returned for work the next day.

In the shops of the Hupp Motor Car Co., duplicate jigs are available, and those in use are constantly being taken out of service and checked for accuracy and wear. This procedure is in addition to the constant checking of the work being produced. The use of standardized bushings for jigs has aided checking considerably, in that if a bushing shows slight wear a new one is substituted immediately.

Naturally all this advance inspection has a strong effect on what can be called preventive measures. It also has an effect on the morale of the workman, who feels that, having been provided with accurate tools, jigs and gages, it is "up to him" to deliver accurate work. A system of this kind reduces scrap losses and saves much time and money.

Control of Inspection

An important factor, in addition to the foregoing, is the question, "Who shall control the inspectors?" To this question there are many answers. If your product is new, and if the engineering and sales departments are not in agreement as to the standards demanded by the customers, it is preferable to have the chief inspector report to the chief engineer. The engineer is admittedly studying his way towards better methods and higher standards, and his blueprints reflect these developments in their changes. He is constantly seeking better work within required limits, while the inspector is largely an interpreter of his demands. It is not always possible to express ideals on a blueprint, therefore, the inspector accepts the compromise between views of the shop and the engineer. In some shops, this situation has been the result of the inspection department being directly responsible to the sales department. The theory, in organizations of this type, is that the sales department, representing the customers who have the ultimate acceptance of the work, should have the factory acceptance. This is sometimes found where the factory departments have control of detail inspection and the sales department control of the final inspection.

There is also a trend towards having a director of quality, directly responsible to the general manager. In such cases, the individual inspectors are responsible to the shop control for discipline and similar functions, but for the upholding of standards, they are responsible to the director of quality.

The general tendency, however, is to have the inspectors under the control of the production superintendent or the factory manager, as they are considered part of the productive force. This is presumably correct, for if quality starts with the man at the machine, as it does, the men who are responsible for the amount of work the man does, should be concerned in its quality. Inspectors should be held liable for passing wrong work, but should not be responsible for the quality itself, unless they have failed to immediately report a falling off in the standards. Far too often is the inspector rebuked for faulty workmanship, when the real fault should be attributed to the man committing it.

Abstracts from Other Publications

The Use of Acetylene in Automotive Repair Work

B. M. Ikert writes on the special value of acetylene gas for brazing and soldering work. In both brazing and soldering jobs heat is the essential element and the more quickly it can be applied and regulated to the particular work in question, the better are the results, other things being equal.

In the automotive shop the occasional jobs calling for soldering or brazing are quickly and economically handled with an outfit comprised of a set of torch heads that can be used in connection with a tank of acetylene gas.

Some torches for acetylene are used with compressed air to furnish what is called a brush flame and needle flame. The gas is supplied by a tank and the air by a foot bellows, storage tank, garage air line or air compressor. The air pressure is usually not over 1 lb., according to the needle flame required. The gas consumption is usually about 1 cu.ft. per hour at 5 lb. gas pressure. The brush flame has a temperature of about 2,800 deg. F., and the correct flame at 5 lb. gas pressure shows a bright, sharply defined inner cone about ¼-in. long and a pale, blue, brushy outer flame about 3 in. long. The needle flame is especially well suited to soldering radiators in such places as the core, where the use of a soldering copper is out of the question owing to its size. The copper wire for brazing purposes should not be over 0.010-in. thick and should be wound closely and evenly around the part to be brazed.—*Motor World*, April 2, p. 22.

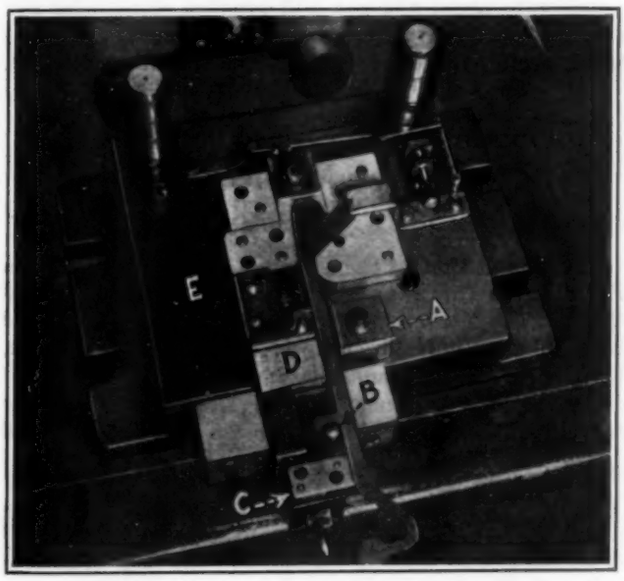
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

An Adjustable Trimming Die for Typewriter Keybars

By William Denton

All of the keybars for the new No. 6 Noiseless typewriter are of the same general appearance, differing only in length to accommodate the four rows, or "banks," of keys and in slight, though important, differences in shape at the ends where they are attached to the mechanism. Were it not for the multi-purpose die shown in the accompanying illustration it would be



A selective trimming die

necessary to have a separate set of blanking tools for each of the 44 keybars; as it is there are but four.

The contour of the die, which is in effect a trimming and piercing die, is made of four separate and easily renewable pieces. The position of the work on the die is determined by four gaging pieces, three of which are capable of adjustment to predetermined and accurate settings, while the fourth is a spring-actuated plunger that serves to hold the work in contact with the fixed gaging points.

This die is of the pillar type, with two substantial guiding pillars at the back, and can be used in any small press. As shown in the illustration, it is lying on a table-truck in the tool vault.

The block *A* is doweled to the bolster and held down by a button-head screw. It may be turned to present any one of its four faces to the work; each face causing the work to be presented to the die in a different position.

In combination with this block the pin *B* and the gage *C* may be set to the different positions required by substituting size-blocks of various dimensions for the one shown at *D* in the die. Advantage may be taken of any one of the three dimensions of each size-block, thus keeping the number of loose pieces required to a minimum. The blocks are stamped not only with their actual dimensions in thousandths of an inch but with the part numbers of the keybars with which they are to be used.

A metal plate *E*, permanently attached to the bolster, is stamped with all the combinations of the setting to be used with various keybars, so that necessary data for setting the tools for any given bar may be always at hand.

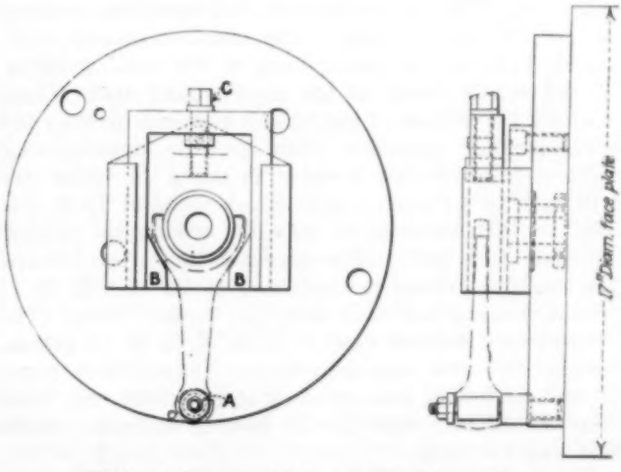
Fixture for Machining Gear-Shift Yokes

By Robert W. Burgess

The illustration shows a fixture for machining transmission gearshift yokes on a J. & L. turret lathe.

The yoke to be machined is a drop forging and is to be bored and to have both sides faced parallel within ± 0.005, in this operation.

The yoke is located on one end by the plug *A* in the faceplate and held by a C-washer and a nut. The fork end of the yoke is drawn toward the center of the fixture in the serrated-edged, open-ended V-block *B*, by operating the screw *C*. The serrations keep the yoke from moving, but are so arranged that unless undue



Fixture for machining gear-shift yokes

IDEAS FROM PRACTICAL MEN

pressure is used, the forked end will not be closed in.

The yoke is rough and finish bored with standard, single-pointed, J. & L. boring bars. It is rough and finish faced with a special bar, equipped with two tool-bits arranged for straddle facing. The cross-feed of the machine is used on this portion of the operation.

Five different yokes can be machined on this fixture by swiveling the V-block holder into different positions. There are five holes for plugs spaced around the face-plate to take care of yokes of different lengths.

Get Full Production from Your Machines

BY ROSCOE A. AMMON

There are many shops running machine tools far under their rated speed, or with an incorrect combination of speed and feed, resulting in production losses which can be avoided if experiments or comparisons are made to determine the best operating conditions. As an example, the writer was able to obtain the following results in a drilling-machine operation in a pipe shop where forged-steel pipe flanges were being produced in large quantities.

The operation consists of drilling twelve 1-in. holes, through flanges 1¼ in. thick, in a heavy-duty drilling machine equipped with a rotating fixture. The work is arranged so that one hole is drilled through two flanges at one time. The usual "milk compound" is used for lubrication:

	Old Method	New Method
Speed	280 r.p.m. (73 ft.)	222 r.p.m. (60 ft.)
Feed	0.012 in. per rev.	0.023 in. per rev.
Cutting time per hole	55 sec.(3 in. deep)	36 sec.(3 in. deep)
Cutting time 12 holes	11 min. 50 sec.	8 min.
Handling time	2 min. average.	2 min. average.
Production, 16 hr.	128 flanges	190 flanges
Production per hour	8 flanges	11¾ flanges
Holes per grind	55 holes	200 holes
Drill ground by	machine	hand
Cost per flange at $1.50 per hour	$0.18¾ each	$0.12¾ each
Increase per day (8 hr.)		31 flanges ($5.81)

In comparing the efficiency of the machine-ground and hand-ground methods of drill pointing, the results of the latter were superior. The cost of a 1-in. drill is approximately $3.00, the total flute length is 6½ in., of which only 3 in. can be used on this operation, making the cost $1.00 per inch. The machine-ground drill, lacking sufficient clearance back of the cutting edges, did not cut as freely as the hand-ground drill. Upon reaching the bottom of the hole, it punched through the work causing excessive wear on the outer-cutting corners, necessitating heavier grinding to bring the drill back to a full-size margin. A speed of 73 ft. per min., on this material, is high for economical results, although some authorities advocate 80 ft. per minute. The machine-ground method used 1½ in. of drill in 14 grinds, making the drill cost per flange 0.023c. The hand-ground method used ¾ in. of drill in 11 grinds, making the drill cost per flange 0.041c. The hand-ground method of drill pointing is advocated only when there is someone who knows how to resharpen drills this way correctly.

The cost of grinding a 1-in. drill varies from 5 to 25c., depending on the equipment, the operator, the amount of material to be removed and the time lost by the drilling-machine operator in changing drills. Figuring on a basis of 5c. per grind, which is low, the difference in performance is sufficient to pay for a drill-pointing machine that will properly point a drill, and it will not take many months to effect a saving sufficient to pay for additional machinery.

Heavy-duty equipment cannot produce as it should unless the cutting tools are ground to carry heavy feeds. When the old style drill-grinding machines were designed, heavy feeds were not used and the drill point produced by such machines lacks sufficient clearance and requires too much pressure to make the drill "bite" into the work. Some shops realize their drills are not cutting freely and assume the web thickness of the drill is to blame. The web is often "thinned," destroying the undercut of the cutting edges. As long as the web thickness on drills under 1½ in. is not more than one-eighth of the diameter, the pressure created will not be as great as from the lack of proper clearance back of the cutting edges.

Get your drills ground right, use a stiff feed and a moderate speed and you will produce more holes per grind, more holes per hour and more holes per drill—all of which will give you your ultimate aim, lower cost.

Automatic Punch-Press Feed Operated by a Magnet

BY W. A. RICHARDS

The installation of the automatic feed, illustrated in Fig. 1, was for a press used in forming galvanized straps. The blank to be formed is shown in Fig. 2, and is of 18-gage galvanized stock, ⅛-in. wide, 4½-in. long, with holes punched and the ends rounded.

The solenoid magnet, *A*, Fig 1, having a plunger travel of 2½ in. and 2 lb. lifting capacity, is energized

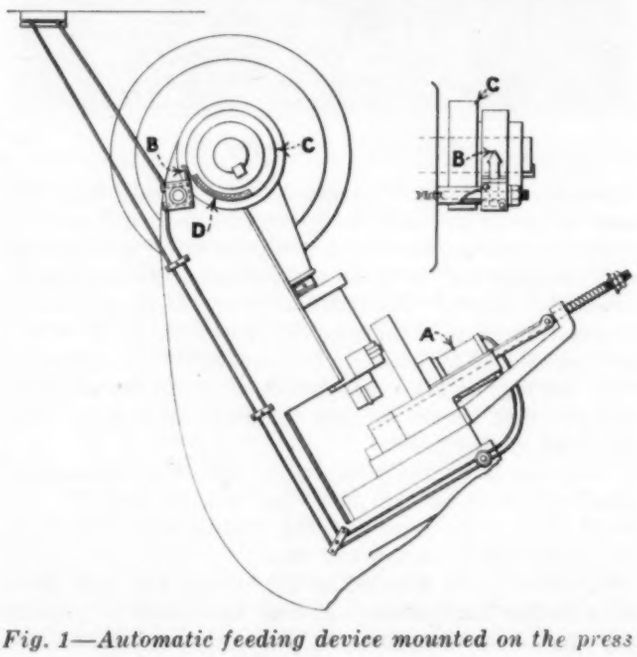


Fig. 1—Automatic feeding device mounted on the press

IDEAS FROM PRACTICAL MEN

from the lighting circuit, the circuit being opened and closed at the proper time by two spring-brass contact fingers, *B*, mounted on a fiber block. This block is held in position by a stud screwed into the press frame. The contact fingers are held against the fiber disk *C*, which is bored and keyseated to fit the end of the press crankshaft. In the face of the disk is a copper insert, *D*, which extends around the circumference of the disk 80 deg. and is so located in reference to the contact fingers that when the crank reaches a point 5 deg. past the center on the downward stroke, contact is made and the circuit remains closed until 85 deg. of the downward stroke has been completed. This is just at the point where the punch touches the work.

As soon as contact is made and the circuit closed, the current energizing the magnet core, *A*, Fig. 3, enters

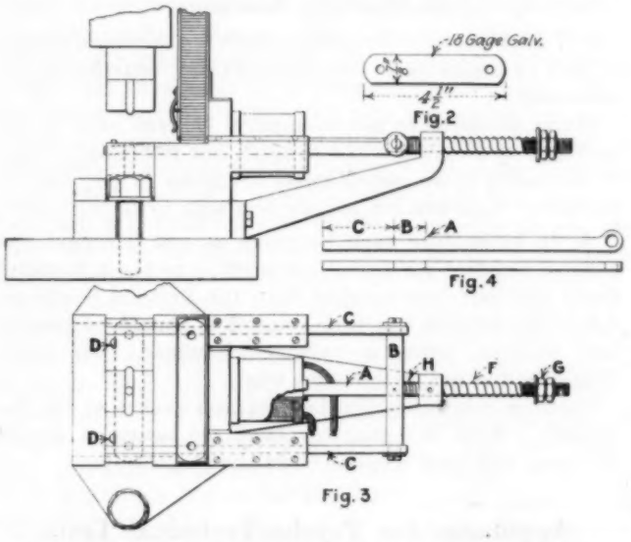


Fig. 2—Details of magazine and blank. Fig. 3—Plan view of automatic-feeding device. Fig. 4—One of the feeder bars

the magnet and carries forward the cross bar *B* to each end of which is connected the feeder bars *C*, *C*. The feeder bars push out the bottom blank from the magazine and place it against stops *D*, *D*. It is held in this position until the punch touches the blank. The circuit is then broken and spring *F* returns the feeder bars to their original position. The adjustment of the spring, *F*, which is made by nut *G*, is an important adjustment since it has two purposes. One is to return the moving parts to their original position, and the other to provide the proper tension, so that when the core is at the end of a stroke, the spring takes most of the pressure and there is just enough tension on the feeder bars to hold the blank snugly against the stops *D*, *D*. The small spring *H* is used to act as a cushion on the return action.

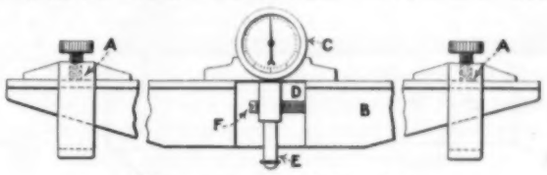
The feeder bars, Fig. 4, are of tempered tool-steel. Care should be taken in machining the bars at *A* to see that the cut is square and that it is at least 0.005 in. less than the thickness of the blank. Dimension, *B*, should be ¼ in. greater than the width of the blank. From that point to the end, the bar should be tapered as at *C*, so that it will not bind in the die when the punch is at the end of a stroke.

The amount of current consumed in energizing the magnet is so small that a 6-volt storage battery can be used as well as the light circuit. The magnet coil should be wound for the voltage used. When the magnet is operated on the light circuit, care must be taken to place a double-plug fuse block, using a 3-amp. fuse between each machine and the light circuit. It is also advisable to place a double-pole snap switch in easy reach of the operator.

Micrometer Straight-Edge

BY HUGH HUMPHREYS

The sketch shows a combination of dial gage and straight-edge that I have found useful for checking the surfaces of planer rails, milling machine tables and similar parts of other machines. It is also adaptable



Micrometer straight-edge

through a change in the foot design, from flat to V-shape, for similar determinations on round work.

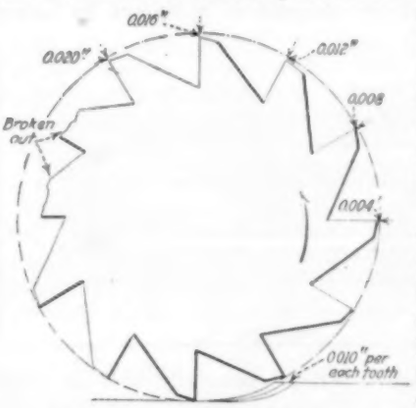
The two feet *A* are adjustable along the beam *B* and are provided with screws to secure them in any desired position. The dial gage *C* is mounted on the slide *D*, which is provided with the extended feeler *E* and the adjusting screw *F*.

While the feet shown at *A* are flat, they can be replaced by feet having V-blocks in the bottoms and made to align with the feeler of the gage so as to check cylindrical work. The beam can be made to suit work of any length.

Using a Cutter with Broken Teeth

BY H. J. GUSTAV KOPSCH

A cutter that has had one or more teeth broken out can be used to finish the job and often may prove to be as serviceable as a perfectly good cutter if the following three, four or five teeth are ground decreasingly smaller.



Doctoring a broken cutter

Assuming a cutter with twelve teeth being fed to the work at a rate of ⅛ in. per revolution of the cutter. Each tooth will have approximately 0.010 in. of material to remove. Now, if two of the teeth are broken out, the following five teeth will have very little more work to do individually if they are "stepped off" as indicated by the figures of the sketch.

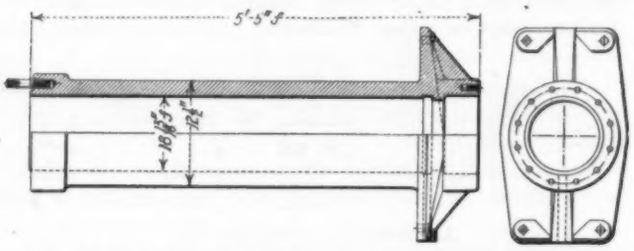
Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Boring Cylinders

Q. Can you tell us the best method of boring cast-iron cylinders like the one shown in the accompanying sketch? At present we are boring them in a lathe. The cylinders are held in two steadyrests and the boring is done with a revolving bar.

A. If the quantity of cylinders to be bored is large enough, it would probably pay you to build a special



holding fixture and abandon the use of the steadyrests.

Otherwise the method you are using is all right, providing your boring bar is equipped with a traveling head and the proper cutting tools.

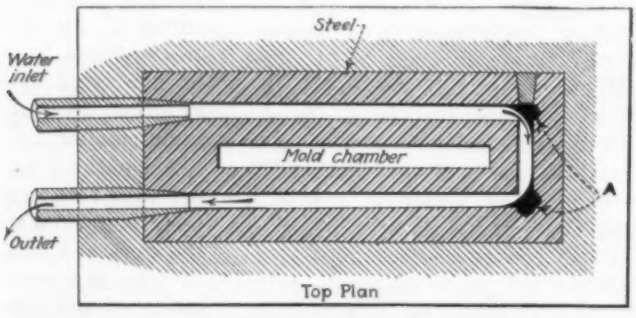
Passages in a Water Jacket

Q. We are using a permanent steel mold in which it is necessary that the mold be kept cool by a circulating water-system. The sketch shows the arrangement. After using the mold some time, clay, lime and other sediment accumulates in the corners of the passage A, obstructing the flow of water.

Can you tell me of some chemical or process by which the deposits mentioned can be dissolved?

A. Regarding the trouble referred to, anything that will dissolve the deposits in the circulating passages will attack the steel of which the mold is made.

You can prevent the deposit of sediment by using



soft water for cooling, either naturally soft or made soft by the addition of a small percentage of soda ash. By having two tanks for the water, the same water can be used over and over, with a slight periodical addition to take care of evaporation. One tank can be elevated so that the water will flow by gravity to the mold, and the other tank can be placed lower than the mold so that the water will flow into it. The water will, of course, have to be pumped from the lower to the higher tank.

If in making the mold, the holes for the water could be drilled through the walls and fitted with plugs at the return end, the passages could readily be cleaned by taking out the plugs and passing a rod or scraper through them. This would obviate the necessity for using soft water.

Babbitting Bearings

Q. I have about 600 castings similar to the engine-beds, in each of which there are two 2 1/8 x 8-in. bearings to be babbitted.

I first intended to use a mandrel the full size of the bearings as a core for the babbitt, but this would make it necessary to do considerable scraping to get smooth surfaces. Can you tell me the best way to do the work?

A. In babbitting such bearings as you describe, the general practice for first class work is to use a mandrel about one-half inch smaller than the finished bearings. After the babbitt has been poured it should be peened into pockets, using a ball-peen hammer. The caps should be treated in the same way.

Peening condenses the babbitt and makes it fill the pockets. With the caps in place, the bearings should be bored and then scraped to fit the shaft.

Apparatus for Psycho-Technical Tests

Q. Can you furnish me with the names of makers of apparatus for psycho-technical tests among workmen in industrial plants?

A. Standard laboratory equipment for psycho-technical tests is made by Stoelting & Co., Chicago. Prof. Max Meyer, at the University of Missouri, has some equipment for such tests and perhaps he can tell you where he obtained it.

There is some equipment made in Germany, but we do not believe it has ever been put on the market in this country. Most of the prominent plants are working out their own tests and are having apparatus made to fit their needs.

Worm Gearing

Q. What power will be transmitted by worm gearing having a ratio of 5 1/8 to 1, if the worm is direct driven from a 20-hp. engine?

A. Theoretically the power transmitted would be 5 1/8 times the initial power applied to the worm, or 101.25 horsepower.

What would be the actual power transmitted is impossible to tell without a detailed drawing of the gearing. The friction loss of worm gearing may be anywhere from 5 to 60 per cent, according to the construction.

Technical Abstracts

Time-Setting in the Machine Tool Plant

Myron A. Lee, Professor of Industrial Engineering, Cornell University, and Dwight Vandevate of the time study department of the Gleason Works, Rochester, N. Y., contribute a series of charts and some tabular information of value to the estimator on spur and helical gears. They lay down general principles to be followed. In setting just and equitable time standards in plants engaged in jobbing or machine-tool work, where designs are in a state of transition, they point out that individual time studies are expensive and impracticable, and that standard times must be set before the job is done for both quotation and production purposes.

By the use of their charts and data, standard times have been set systematically with a variation of less than 5 per cent from the actual time used. A complete example of a particular gear, 16 D.P., ¾-in. face and 40 teeth, is given in this article. Fifteen pieces were required and the total standard time worked out to 154.1 minutes.—*Industrial Management*, March, p. 152.

Personnel Administration

C. S. Ching, supervisor of Industrial Relations, the United States Rubber Co., states that the biggest job a personnel man has is that of establishing confidence in himself on the part of the entire organization. In his experience where such confidence is established getting the ideas across follows almost automatically. If this confidence has not been established, no matter how right you may be, you probably will not be able to get the ideas across.

The industrial relations manager who can talk nothing but labor relations, who in every conversation with the general manager or plant manager continually harps upon labor turnover, absenteeism, and continuity of employment, will soon find himself an unwelcome conversationalist.

The personnel man should know what is going on in the plant and what it is all about. He should not regard himself as a specialist waiting to be called into consultation on special occasions, but as a full-time production man who is on his job handling the duties connected with personnel.—*American Management Review*, April, p. 112.

Factory Co-operation with the Sales Department

T. H. Kane, vice-president and works manager, the Truscon Steel Co., shows how the production department co-operates with the sales department. In general the plant-development policy has been consistently based on two steps that naturally alternate. First, equipment that will pay for itself within a year or so, should be installed; second, new work should be given to the equipment to cut the overhead cost by keeping it continuously busy.

Mr. Kane quotes his statement to the sales department on the subject of choosing each new product and continuing plant facilities as follows:

"The fact that a job calls for a product similar to those we are already manufacturing does not mean that this product is necessarily a good one for the company to venture in. However, if information comes from different sources and along similar lines it usually finds a solution in development and improvement, or in a new product standardized to meet the several requirements. The sales department is placed in a very advantageous position to give the company at first hand all requirements. Sometimes it is found that when the first inquiry comes in, it does not warrant the factory taking on the business, but if this inquiry comes in in a slightly modified form from other sources, then the factory usually investigates, and if they find there is a market for a product they begin to standardize it and manufacture accordingly."

One amazing fact is that with comparatively the same floor area and equipment and a parallel force of workmen, a vastly larger amount of products can be turned out in the standard shop than in the special shop.—*Factory*, April, p. 581.

Metallurgical Research in England

Dr. Walter Rosenhain in charge of the metallurgical buildings of the National Physical Laboratory in England describes his buildings, their equipment and the work he is doing. There is a sketch plan given of the metallurgy department at the laboratory.

This work has grown during the past twenty years from very small beginnings, originally from the work of the Alloys Research Committee of the Institution of Mechanical Engineers. The department now possesses a scientific staff of over 20 men with other grades totaling more than 80 persons, while the equipment of the buildings and range of work have increased correspondingly.

This large development is due in part to the fact that the aspect of metallurgy with which the laboratory deals, sometimes known as "physical metallurgy," was a comparatively new science in 1900, and this branch of the laboratory has grown.

Scientific metallurgy has now come to occupy an important place in the application of science to the metallurgical and engineering industries. It is even beginning to make itself felt in the range of pure science itself. The laboratories are arranged as a series of comparatively small rooms, each arranged for a specific kind of work.

The microscope equipment used is widely different from that to be found in any American metallurgical laboratory. The "inverted" type of microscope does not find favor, mainly owing to the fact that for careful and prolonged visual examinations it is inconvenient and unsatisfactory. For the best kind of photo-micrographic work better results can be obtained with a horizontal microscope in which the use of image-reflection is avoided.

The Haughton and Hanson thermostat is used extensively in the laboratory. Accuracy of temperature control within about one deg. C. can be maintained with temperatures up to 1,000 deg. C.—*The Iron Age*, April 2, p. 975.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Foolishness of Inflexible Legislation

THE eight-hour day has become fairly well established, in principle at least, in many quarters. Few people object seriously to the clauses in governmental contracts that specify a forty-eight hour week as the basis for contracts. But when the contracts insist that work "shall not exceed eight hours in any calendar day," it not only gets into the realm of foolishness but interferes materially with the increasing tendency toward the Saturday half holiday.

In one shop largely engaged in governmental work, the men elected to work the forty-eight hours in five days and so have the whole of Saturday and Sunday to themselves. This plan has worked well, for them at least, for several years, and they resent any interference with it, even though it does make rather long hours for the other five days.

There are also shops in which the men have chosen to put in the required number of working hours in five days so that they could have both Saturday and Sunday free. If this plan works to the satisfaction of those concerned it is certainly uncalled-for interference to prohibit it by legislation.

The theory behind such restrictive legislation is, of course, the conserving of the health and welfare of the nation's greatest asset, the workers, without whose labor the best laid plans could not be realized. But all such laws should not be made so inflexible as to prevent a liberal interpretation that is satisfactory to all concerned.

An Industrial Round Table

AT THE Industrial Round Table of the National Civic Federation a few days ago able representatives of the public, labor and industry expressed beliefs and hopes that are worth remembering. Gerard Swope of the General Electric Co., speaking for industry, emphasized the great benefits to be obtained by encouraging the worker to give constructive thought to the problems of the company that employs him. There is nothing new in this idea, of course, but Mr. Swope was able to back up his point with the statement that his company has adopted five thousand suggestions made by employees during the last two years and has paid out $100,000 over and above wages in return. Here is clear proof that the much-maligned suggestion system can be made to work. As we have pointed out more than once, however, its success depends upon the active interest of men high up in the executive ranks.

If all labor leaders accepted and acted upon President Green's stated beliefs as to the need for adopting economical processes, promoting individual efficiency and maintaining industrial peace, the savings to all of us would be enormous. There is at least hope for improvement in the future when the president of the American Federation of Labor has the courage and conviction to announce publicly his adherence to tenets that are distinctly at variance to the actions of many of his lieutenants.

The case of the public did not suffer in the hands of Secretary Hoover. He expressed a belief in the awakening of labor to a new sense of its responsibility to the community as well as the passing of the idea that labor is a competitive commodity where wage has no relation to necessity or proportion of the total income. Looking ahead Mr. Hoover prophesied the speedy coming of a new relationship in the whole setting of industry. With the passing of corporation ownership into the hands of the relatively small investor, managers are rising out of the skill of industry with a vision of their responsibility to the consumer, to the worker and to capital. As competition and industrial strife diminish, the safety of capital will increase and it will become cheaper. Under the new order there is a community of interest in waste elimination. "To deal with waste by such action is to strengthen the very foundations of a better relationship between employer and employee."

Just Suppose

JUST suppose you had a nice, good natured, well meaning cashier who had the little failing of losing your money, sometimes by paying bills twice, sometimes by stuffing bills in some corner where he cannot find them later on and sometimes by just losing them, but never by dishonesty, wouldn't you ask him politely to please be a little more careful in the future and wouldn't you be surprised if he resented it and told you to mind your own business?

Now suppose you have a superintendent in your shop who loses your money quite regularly by spoiled work, idle machine tools, lack of material, but never by being lazy or disloyal, wouldn't you be surprised if he flared up and told you where to go if you requested him to be a little more careful?

"But," you say, "I am the Manager and have sense enough not to bother the super about things of which he knows more than I."

Hm—yes, that is where the trouble may lie. But all the same

Just suppose

Shop Equipment News

Cincinnati Hypro 8-Ft. Boring Mill

The Cincinnati Planer Co., Cincinnati, Ohio, has developed and added an 8-ft. boring mill to its line of machine tools which follows the same policy of providing centralized, interlocking and safeguarded control; eliminating unnecessary wearing parts; increasing the rigidity of construction and simplifying the problem of manipulating heavy equipment as it announced for the Hypro planer previously described on page 513, Vol. 62 of the *American Machinist*. A view of the operator's side is shown in Fig. 1, which illustrates an assembled complete machine.

A motor-driven rail-lift mechanism is set in operation by manipulating a control lever to a dog clutch in the rapid-traverse assembly which is mounted on top of the machine, as illustrated in Fig. 2. All of the gears in this assembly are of steel. The action is positively interlocked with the rapid-traverse control of the head and is further provided with an automatic limit stop.

The rapid-power traverse is operated by another control lever mounted at the operator's positions on both sides of the table. It is arranged so one movement, vertically, disengages the feeds and a part turn, horizontally, while the lever is in its upper position, rotates a dog clutch, which in turn engages one or the other of the friction clutches shown in Fig. 2, and moves the heads vertically, or laterally in the direction toward which the lever is turned. By bringing the lever back and down to normal position, the rapid traverse is cut off and the feed is engaged again. This control lever is best illustrated in Figs. 3 and 4, where it projects toward the front from the top of the feed boxes, one of which is on the column at each side of the table. The dog clutch which disengages the feed when the rapid-traverse lever is lifted may also be seen in Fig. 4 particularly well.

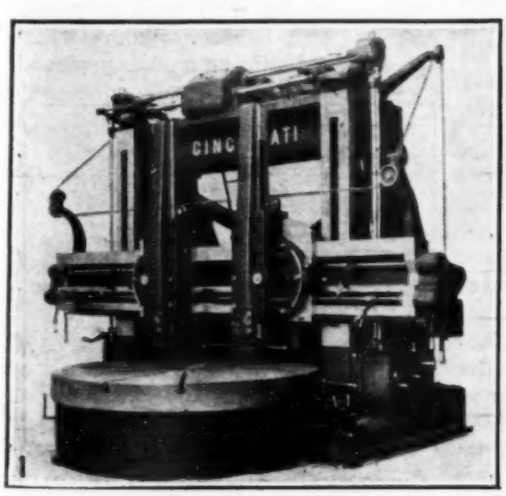
Quick-adjustment handles are provided on the traverse screw and the feed shaft in the rail, on both sides of the table, for making the final tool setting without going to the end of the rail. Graduated collars are provided on both feeds for accurate adjustment.

The feed changes are made in the boxes just referred to in Figs. 3 and 4. The feeds are graduated to read direct in inches per revolution of the table. The feed-box gears are all of steel.

The mill is further arranged so the positive speed changes may be made from the operator's position by manipulating the two vertical levers shown in front of the base in Fig. 3. These levers operate the gear shifts in the speed box at the rear of the machine. Another horizontally-arranged lever, which may be seen between these two and the rapid traverse control, is designed to assist in setting up work. It operates a clutch and brake on a high-speed shaft in the driving mechanism. The clutch is mounted on the front of the mechanism, as shown in Fig. 5, while the brake is on the opposite side and can be seen in Fig. 6. When alternating current is used, this lever is a particularly important one. The speed-gear box in its construction and location between the housings acts as a tie between them to afford additional rigidity to the base of the machine and provides a location for the driving motor. All of the driving gears in the box are of steel and in their assembly include clutches for speed-change combinations. The back-gear shaft extends through the front and terminates in a third bearing in the main machine bed. The table-pinion shaft also extends from the bed to a third bearing in the speed-gear box.

The bevel driving pinion is mounted between two of the bearings so there is no overhang. It is made of chrome-nickel steel and heat-treated. The bearings are of bronze and are arranged for ample lubrication. Within the box, all shafts are covered with oil and protected on their ends with dirt tight caps.

The table bearing has been located in, toward the center, rather than



1

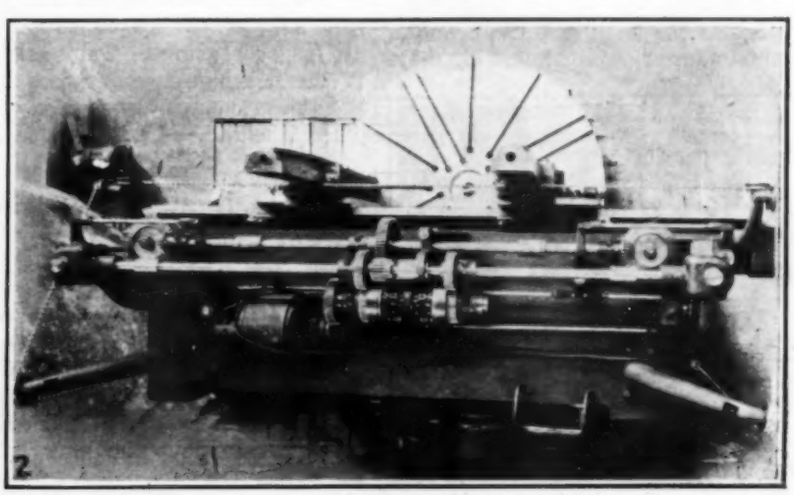
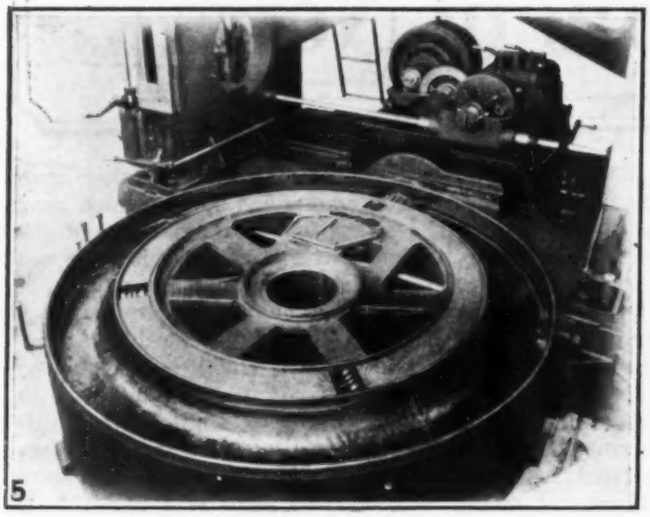

2

Fig. 1—Cincinnati Hypro 8-Ft. Boring Mill. Fig. 2—The rapid traverse mechanism

SHOP EQUIPMENT NEWS



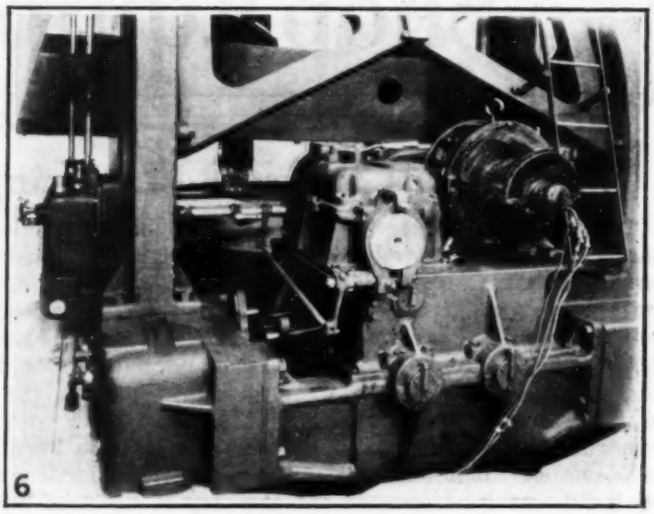


Fig. 5—Bed and drive with the table removed. Fig. 6—The rear of the machine

near the edge of the table in order to bring the support as nearly as possible under the normal position of the load and lessen the tendency to spring the table. Heavy radial ribs are used in the bed to the center bearing to obtain the most of rigidity possible. The center bearing itself is made adjustable to compensate for wear.

The table is provided with radial and parallel T-slots to assist in setting up, is stiffened with heavy radial ribs, is fitted to a ground spindle to ride in the center bearing in the bed and is driven by the driving gear at its extreme outer diameter to obtain a maximum of leverage.

The wide-face housings are bolted to box-type extensions on the side of the bed. A box-type arch ties the housings together at the top, and with the strength afforded by the feed box at the bottom and cross braces on the back give the machine a maximum of strength and rigidity.

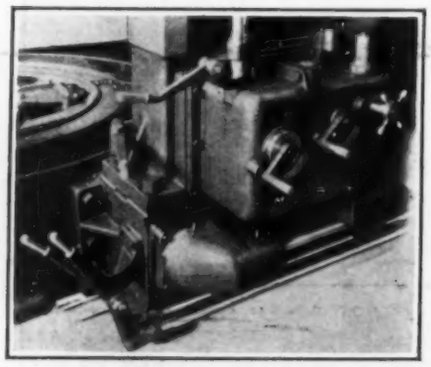


Fig. 3—Grouping of levers and feed box on the right-hand side

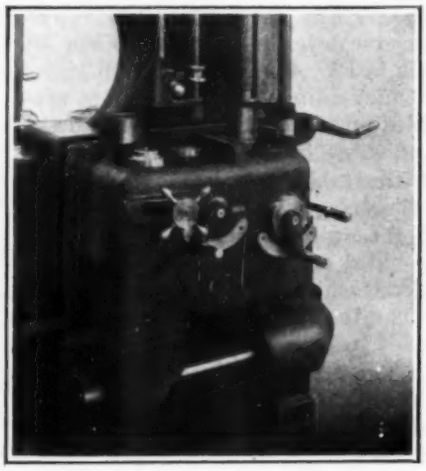


Fig. 4—Levers and left-hand feed box

All bearings are bronze bushed and have ample facilities for oiling. Oil cups and oilers have been displaced wherever possible by the use of centralized oil distributors which will hold a ten days' supply for groups of bearings. They serve all of the bearings in both feed boxes and the mechanism assembled on the top of the rail.

Kingsbury Automatic Burring Machine

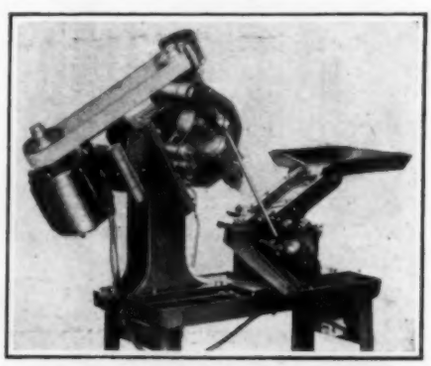
An addition to the line of automatic drilling machines manufactured by the Kingsbury Manufacturing Co., Keene, N. H., is the automatic burring machine designed for countersinking the rear end of a hole, to remove the burr left by the cutting-off tool.

The work is taken from the bottom of the chute and pressed against a gage block by a reciprocating link attached to toggle levers. These levers straighten out in their final movement and exert sufficient pressure on the work to prevent turning during the burring operation. As the link draws back to grip a new piece, the finished work drops out of the fixture.

The forward movement of the link is under pressure, controlled by a cam on the friction gear of the drill head, so that if excessive pressure is exerted, as might happen if the work were fed in wrong, the machine would stop without subjecting any of the mechanism or tools to break or strain.

The fixture is designed so it can be used for various drilling and tapping operations, using the chute for feeding purposes.

The standard Kingsbury automatic sensitive drill head is used, mounted at a 60 deg. angle, so that the work is fed in on a 30 deg. plane.

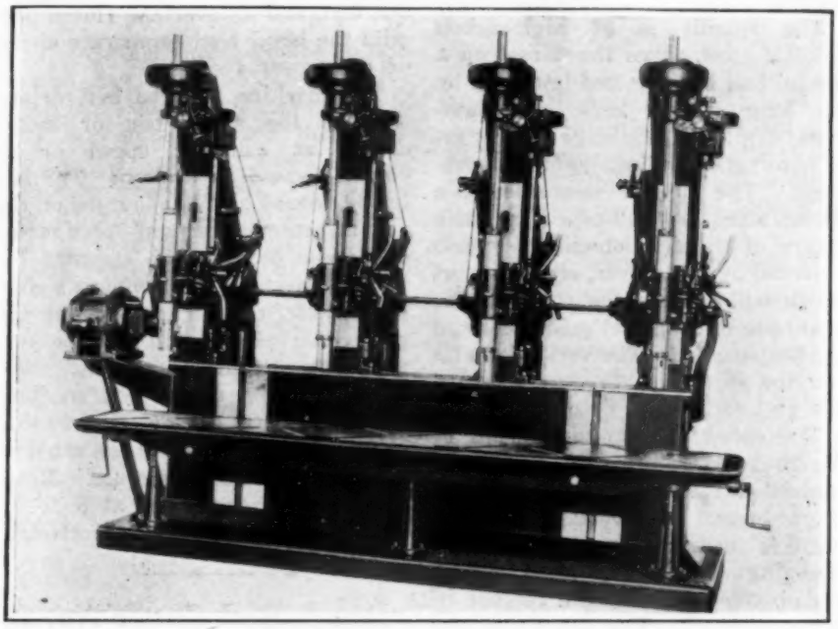


Kingsbury Automatic Burring Machine

SHOP EQUIPMENT NEWS

Barnes Drill Co. Gang Drill No. 263

By combining on a common base four of its No. 263, sliding-head, self-oiled, all-geared drills, previously described on page 486, Vol. 60, of the *American Machinist*, the Barnes Drill Co., Rockford, Ill., has developed the gang drill illustrated.



Barnes Drill Co. Gang Drill No. 263

One of the units is mounted in a stationary position on the left-hand side of the base to gear drive direct from the motor, which is located on an extending bracket and the drive shaft for this unit has been extended through the other three units to a stationary, outboard bearing holding the shaft in alignment at the right-hand side.

The top of the base is machined to provide ways for the three movable units and a rack is set to engage a pinion and shaft on each of the heads for moving them to the position desired. Clamp bolts hold the units in place after adjustment has been made.

A vertically-adjustable table is supported on three jack screws which connect through worms and wormwheels to adjusting levers at both ends. There are two guides for the table on the base column and clamp screws extend from them to the front of the table for securing it in a set position. The table top is arranged with tee slots for clamping and has a generous size of trough for cutting lubricant on its edges.

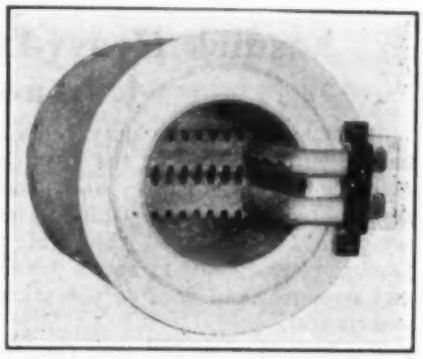
The units may be set at a minimum of 19 in. between centers on adjacent spindles. The maximum distance between the two outer-spindle centers is 96 in. which permits of setting the units to equal, maximum, center distances of 24 in.

The company is prepared to furnish the machine with fixed spindles on this maximum equal center distance, either in box- or independent-column style, and the latter style in either square or round columns.

General Electric Immersion Heating Unit

An immersion heating unit consisting of a helicoil-sheath wire cast into iron has been marketed by the General Electric Co., Schenectady, N. Y. The unit is designed for use in oil tempering baths and melting pots for lead, tin and alloys that will not attack iron.

On the units for melting pots, the cast iron portion is brought up on the neck out of the pot, and is heated to allow for expansion, when cold metal is being melted. The cast iron protects the steel from corrosion by the molten metal. To maintain the temperature of the heating unit at a low point, the casting is constructed with ribs. These units are being made in capacities up to 5 kw., and can be obtained either individually or in the form of melting pots and tempering baths complete.



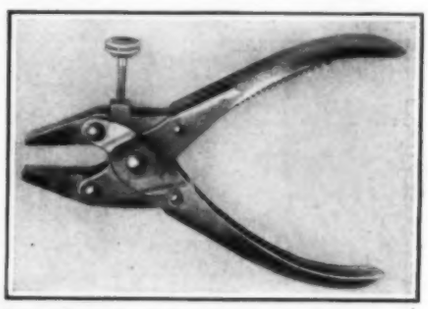
General Electric Immersion Heating Unit

Schollhorn Bernard Hand-Vise Pliers

The addition of a thumb-screw locking arrangement, as illustrated, to its line of pliers has been made by the William Schollhorn Co., 414 Chapel St., New Haven, Conn., to increase the usefulness of the tool.

Two pieces, such as a key and key blank may be matched together, gripped in the plier jaws and held securely for filing by setting the thumb screw. Parts can be held for soldering and rod stock can be clamped and rotated while it is being filed to relieve the worker from strain in holding the jaws together.

The thumb screw may be backed out when not in use and the pliers used in the ordinary manner without interference from the clamping arrangement.



Schollhorn Bernard Hand-Vise Pliers

SHOP EQUIPMENT NEWS

Fosdick Heavy-Duty Radial Drills, 4, 5- and 6-Foot

Three sizes of heavy-duty radials have been announced by the Fosdick Machine Tool Co., Blue Rock and Apple Sts., Cincinnati, Ohio. The company has featured the design from the standpoints of ample power and strength, and ease of operation and control.

The base is of ribbed construction and is surrounded by an oil channel, the edge of which is planed flush with the working surface. There is a full ribbed section directly ahead of the column and the T-slots are located to make a maximum of the surface available. A plain table is regularly furnished, but a universal or tilting table is available to specifications.

The tubular column contains a rigid inner column extending to the top where annular and thrust ball bearings are used for the swing motion of the arm. The column-clamping lever is located so it does not interfere with work on the base when the arm is swung over the table to one side.

The arm is designed to resist torsion as well as bending. Clamping levers between it and the column are located for the convenience of the operator.

The head is of the fully-inclosed type and is moved by a handwheel placed to the right to enable the operator to swing the arm and move the head with one hand while he uses the other for raising or lowering the spindle.

The spindle is of high-carbon crucible steel, takes the thrust on a special ball bearing and is driven by two long driving keys. An automatic depth and trip gage may be set to automatically limit spindle movement. The spindle sleeve is of a special steel, bronze bushed. A quick return of the friction-clutch type is operated by two levers, either one of which will operate the clutch. The gears are of a special gear steel and are heat-treated. The vertical shafts and the elevating screw are turned and ground to size.

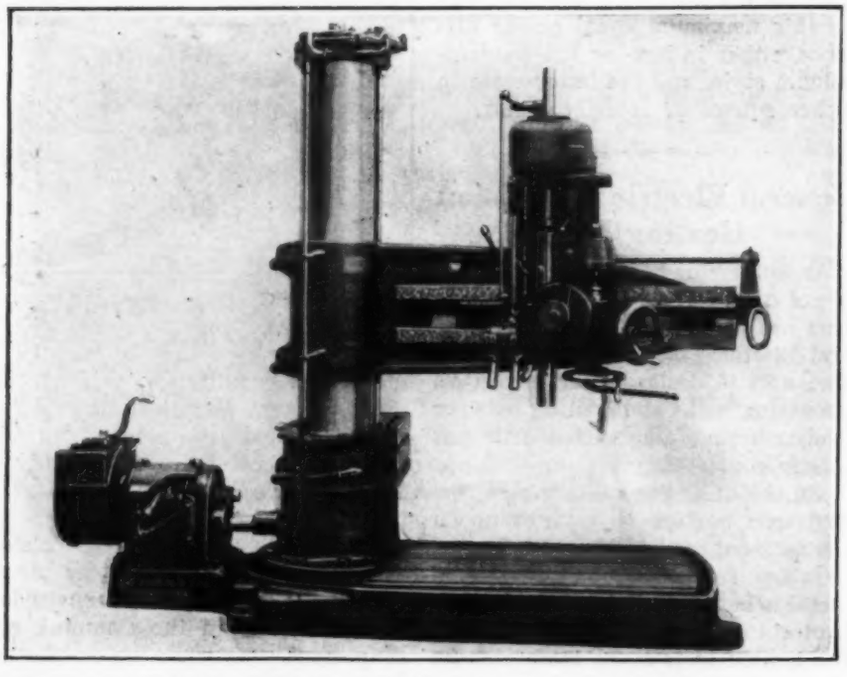
The speed box contains gears of the 20-deg. involute type, which are controlled for speed changes by a single lever. An overtake arrangement is included to avoid shock in changing. Tight and loose pulleys are provided to eliminate the use of a countershaft. For belt drive, the box is arranged with the company's patented belt guard and shifter. The tapping-reverse friction is of the multiple-dry-disk type adjustable on the outside for any required load.

Ball bearings are used in the head for the spindle and intermediate shaft bearings, and for the spindle thrust in the vertical shaft and elevating screw supports, and in the feed mechanism. All other running parts are bronze bushed.

Feed changes are effected with one lever, which has a direct-reading index dial, and an overtake clutch permits the hand feed to operate ahead of the power feed.

The machine may be belt driven through the speed box or motor driven at constant speed or at variable speed as desired. The latter drive may also be mounted on the arm direct, or a constant-speed motor and speed box may be specified for this mounting. The company's compressed-air column clamp and oil pump and piping will also be furnished to customer's request.

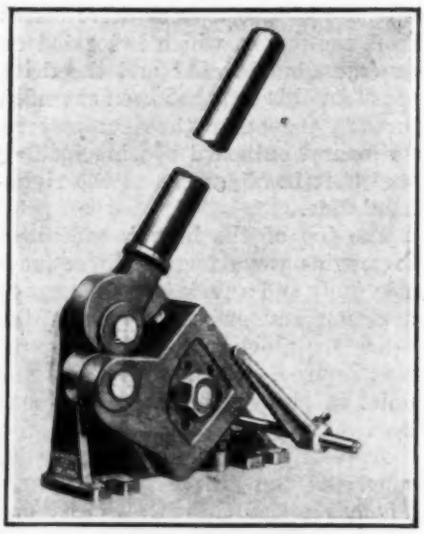
The capacity of the 3-ft. machine is from $\frac{5}{16}$ to 3 in., high speed in steel or iron, while the others are rated up to 4 inches as a maximum. Motor sizes are recommended at 5 to 7½, 7½ to 10 and 10 to 15 hp. respectively.



Fosdick Heavy-Duty Radial Drills 4-, 5- and 6-Foot

Bench Rod Cutter No. 2

The Bench Machine Tool Co., 220 North 13th St., Philadelphia, Pa., has added another size to its line of rod cutters. It is designed for mounting on a bench and has capacity to cut round rods of any metal from $\frac{3}{8}$ to $\frac{3}{4}$ in. in diameter.



Bench Rod Cutter No. 2

The hand-operated lever actuates

SHOP EQUIPMENT NEWS

the cutting tool through a cam action. The cutting dies are made of a special alloy tool steel, hardened and ground. The studs are also made of alloy steel. A length gage is provided for setting the work. The cutter makes a square cut on account of the design of the dies so that very little deformation of the work takes place.

Fox Four-Way, Multiple-Spindle Tapping Machine

The special-purpose machine illustrated has been built by the Fox Machine Company, Jackson, Michigan, for simultaneously tapping all of the 68 holes in a six-cylinder, gasoline engine block. The holes were previously drilled at one time on a multiple-spindle, semi-automatic machine, similar to that described on page 443, Vol. 62, of the *American Machinist*. The front, or working side of the machine, is illustrated in Fig. 1, while Fig. 2 is a rear view.

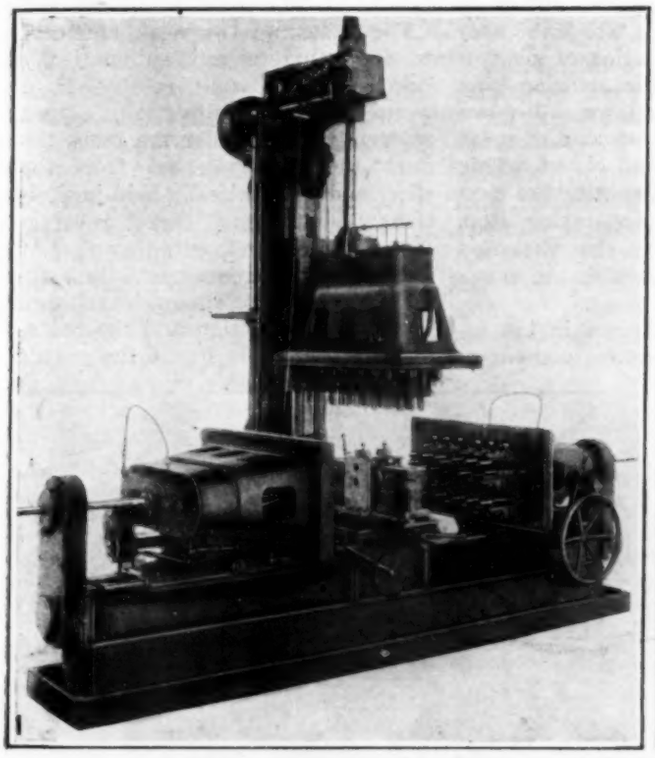
The spindles are grouped in each of the four heads and attached to cluster plates that hold them in the proper relation to each other to register exactly with the drilled holes. They may be adjusted in or out independently. There are 23 spindles in the right-hand head, 10 on the left side, 28 in the vertical cluster and 6 in the auxiliary head in the column, all of which carry $\frac{3}{8}$-in., 16-thread taps. There is one spindle in addition in the auxiliary head carrying a $\frac{1}{4}$-in., 18-thread pipe tap. The spindles are all equipped with floating tap holders and detachable tap collets.

A 15-hp. motor is connected by silent chain to drive the three horizontal heads and another of 10 hp. is used to drive the vertical head and the pumps for circulating lubricant to all of the bearings, using the Fox system as also installed on the drill referred to. The heads are mounted on ways similar in construction to those designed for the drilling machine and are arranged to be moved as a unit. Additional provision is made, however, to adjust any one independent of the others.

Fox standard tapping controls are used, located at the rear on the base, for the three horizontal heads, and on the top of the column for the one feeding vertically. The controls may be operated to instantly stop the head movement.

Feed, forward and back, which is effected through gearing, and timed to the pitch of the taps, is set in motion by means of a lever conveniently located at the operator's position. Throwing this lever into the running position causes the spindles to rotate in a clockwise direction and the heads to advance. At the proper time reversal of rotation and direction of travel is taken care of automatically and the heads retreat to a certain "out" position where motion ceases until started again for the next cycle.

The Wilson Foundry & Machine Co., Pontiac, Michigan, is operating the drill and the tapping machine on the Willys-Knight cylinder block, where it is said that the drilling time is 60 sec. and the tapping time 15 sec., while floor to floor requires 76 sec. in one case and 33 sec. in the other. The net weight of the machine with motor, is 19,238 lb. of which 18,012 lb. is represented by the machine alone.



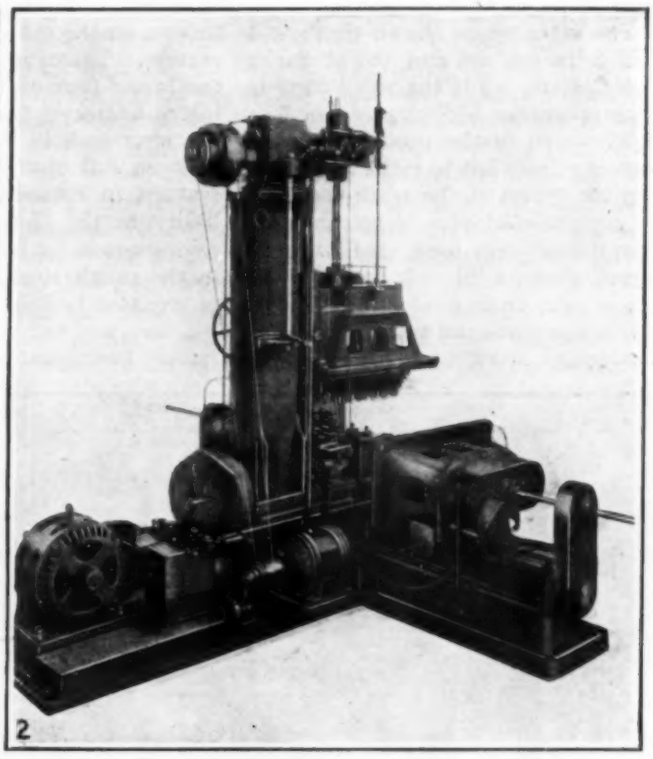


Fig. 1—Fox Four-Way, Multiple-Spindle Tapping Machine. Fig. 2—A rear view of the machine

SHOP EQUIPMENT NEWS

Cincinnati Engineering Tool Co. Vertical Automatic Machine

A six-station machine which provides for a loading and unloading station and five progressive working positions has been designed especially for quantity production of a variety of parts by the Cincinnati Engineering Tool Co., 4659 Spring Grove Ave., Cincinnati, Ohio. It is applicable to complete machining of valve stems, stuffing boxes, carburetor parts, faucet bodies, safety nuts, spark plugs, automotive drop forgings and in general to any piece that can be completed in the five operations and that requires not more than 3½ in. of vertical travel.

The machine as shown in Figs. 1 and 2 is set up and tooled for a faucet stem, while the work done in each operation is illustrated in Fig. 3, arranged in the proper sequence. Reading from left to right, or following the travel of the work turret in a counter-clockwise direction, the operations are load, hollow mill, knurl, chase, drill end, and tap end. It is said that production on this particular piece can be maintained at twelve per minute.

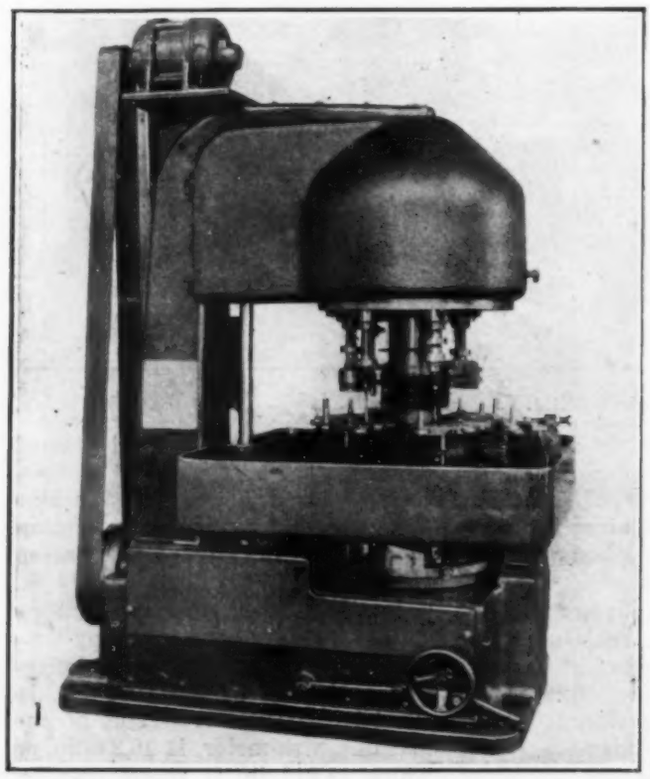
In Fig. 2, which is a front view, a guard is shown completely inclosing the box mill. This guard is designed to guide the chips into a receptacle which may be placed beside the chip pan in order to keep them from collecting in the pan and requiring interruption of the continuous production to clean them out.

One of the automatically operated chucks is shown in Fig. 4 in the open position. Movement of the roller-carrying arm swings the jaws about their centering pivot. The design is such that the forces are equalized and no lateral strain is thrown on the pin on which the arm centers. The cam action of slots in the lower face of the arm, on pins in the bodies of the jaws, will move the jaws or hold them at any point between full open and closed. This feature, in connection with the flexibility in the chuck-operating stop, compensates for any size variation in the rough stock which the chuck is required to hold.

There are two turrets in the assembly below the chucks, one carrying the chucks themselves and the other mounting the feed cams. The upper or work turret is fitted with sleeves through which a stem on each chuck table projects to guide the feed movement vertically, while keys secured to the center column ride in corresponding ways in each table to keep it in line horizontally.

The lower turret is fitted with detachable cams which are properly designed for each operation on a given piece of work, and rotates in a clockwise direction to feed the work up and draw it back again. With this design, each chuck is fed at a speed commensurate with the work to be done. It is said that a complete set of cams can be removed and replaced in five minutes.

For indexing, the work and cam or feed turrets are automatically locked together and rotated in a counter-clockwise direction. Upon centering again under the tools, the work turret is released from the other and automatically held in position while the feed turret reverses for the feed and withdrawal. At this point, the two again lock together, the work turret is released from its set position and the indexing is repeated. In Fig. 6 the guards



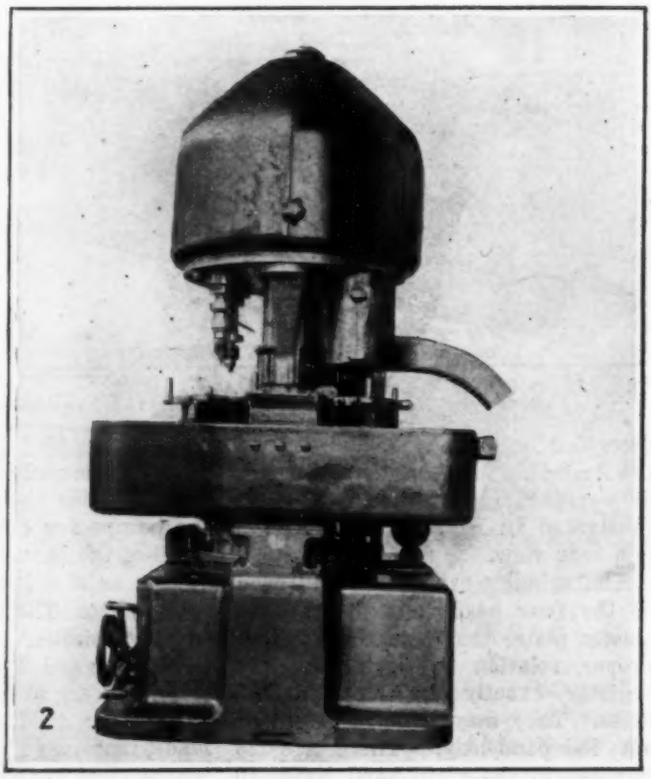


Fig. 1—Cincinnati Engineering Tool Co. Vertical Automatic Machine. Fig. 2—A front view showing the box tool chip guard

SHOP EQUIPMENT NEWS

have been removed to show the units.

The tools are held into the No. 2 Morse taper in the spindles by draw-in bolts and are driven by face keys. Feeds between 160 and 1,800 r.p.m., can be set for any spindle by placing the proper combination of change gears. The construction at this point is a special adaption of a standard design in which the gears

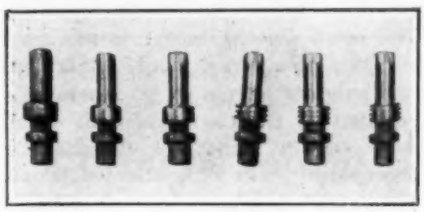


Fig. 3—The sequence of operations on a faucet stem

are placed in position on idler studs and moved into mesh, after which the spindle box is swung in to mesh them with the drive gear and is secured in this position. The spindle carrying the box tool is compound, having a drill spindle riding on ball bearings inside the box-tool spindle. By means of gears arranged at the top, the drill can be driven at its best speed regardless of the rotation set for the box tool.

The spindles are adjustable in height by turning them on their threads in the spindle head after the locking nuts at the top and bottom have been loosened.

Starting the 7½-hp., 1,200-r.p.m. driving motor sets the spindles to rotating, but does not affect the work and feed turrets until a friction clutch is thrown in. This clutch is actuated by a foot treadle located on the left-hand side of the base as shown. A brake is provided for quick stop and is set by moving the treadle to the idle position. The spindles can, therefore, rotate without the feed being thrown in, but the feed cannot be operated alone unless the spindle-drive change gears are taken out of mesh. The handwheel located near the treadle is for turning the feed by hand to assist in setting up the work at the start.

All main shafts and spindles are of high-carbon alloy steel and are mounted on radial and thrust bearings. The main driving gears are of the same material, heat-treated, as is the main driving worm. The worm-wheel is of cast iron. Flood lubrication on the mechanism in the base is supplied by a geared pump, which also feeds to the other essential points.

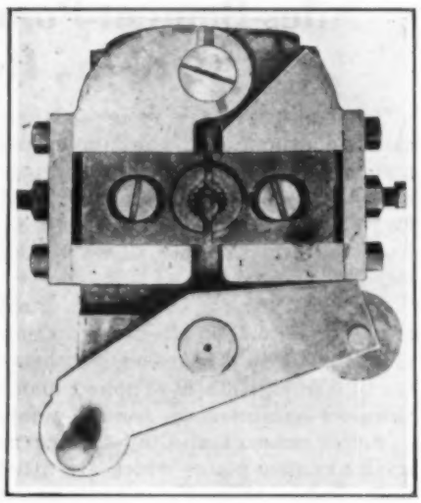


Fig. 4—One of the work-holding chucks

The machine is regularly equipped with a cutting-lubricant pump, and the machine parts are arranged to carry this lubricant to and from the work without harm to their own working surfaces. The machine weighs 5,750 lbs. net, is 80 in. in height by 40 in. in width by 69 in. in length. The driving motor is furnished by the customer or by the company when the customer so specifies.

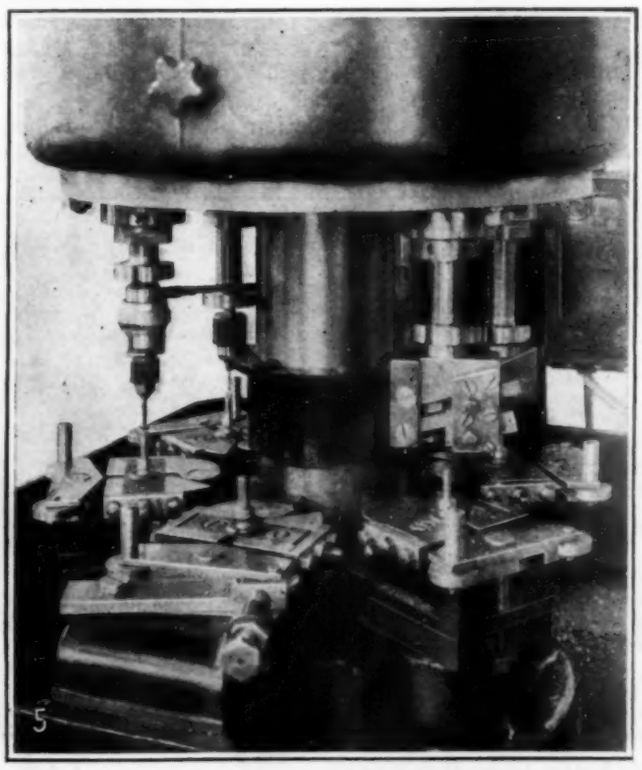


Fig. 5—A detail view of the faucet stem set-up.

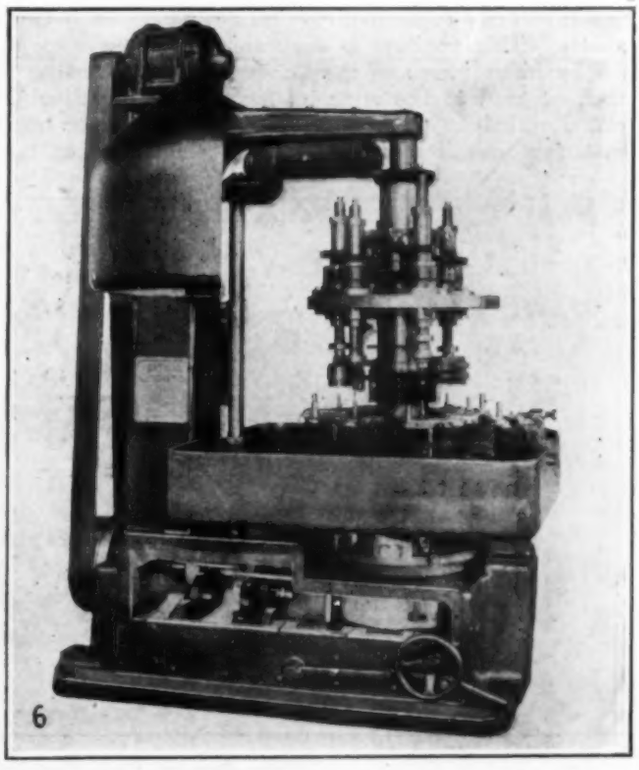


Fig. 6—The spindle and driving mechanism exposed

SHOP EQUIPMENT NEWS

Niles-Bement-Pond Crankshaft Lathe 48-In., Heavy Duty

To insure greater accuracy than can be obtained with ordinary means and to reduce the setting and machining time, the Niles-Bement-Pond Co., 111 Broadway, New York, N. Y., has developed the specially equipped lathe illustrated.

The head stock is fully inclosed and houses all-steel gears whose shafts ride in bronze-bushed bearings. Lubrication is supplied under pressure continuously from a pump.

Both headstock and tailstock carry auxiliary face plates which are fitted with index pins for aligning the work as it is being first set up, and are further provided with tee-slots for bolting on fixtures which locate and drive the work.

The fixture consists of a driver which is arranged to hold and clamp around the ends of the crank shaft and a slide on which it is mounted. The slide is designed with graduated ways and a screw for setting the driver at a position off-center to match the throw of the crank. Tapered pins are used to prevent any movement of the slide after it has been set. The driver can also be located on the slide to correspond to the angularity of multithrow crankshafts. This position is accurately set by index pins and the driver is then secured to the slide by heavy clamping bolts.

A three-position, turret tool-post is carried on the front of the carriage and is designed with a positive-locking index pin and powerful clamping bolts. On the rear of the carriage there is a plain toolpost with a laterally adjustable toolslide which carries tools for turning the ends of the crank cheeks while the tools in the turret are rough cutting the journals.

On the bed between the carriage and the headstock a special design of steadyrest is arranged to support the shaft against spring and chatter when heavy cuts are being taken. The frame of the rest is split horizontally and hinged to open somewhat below its center. It is bored in exact alignment with the lathe spindle to form a bearing for an inner part. This part is cut out for the crank and designed with a pair of shoulders on each side to carry adjustable jaws that can be clamped against the cheeks. Different inner sections can be fitted into the frame to suit varying designs in the crankshafts to be turned by hinging back the upper sections of the frame.

A second steady rest, for use when turning multithrow crankshafts, is mounted between the carriage and the tailstock. It consists of an offset ring rotating in adjustable jaws. Three adjustable clamps are set around the hole in this ring to grip and support the work. The rest is used with the ring when the pins are being turned and the journals are rotating off center, and with the ring removed and the adjustable jaws adding their support to the drivers when turning the journals.

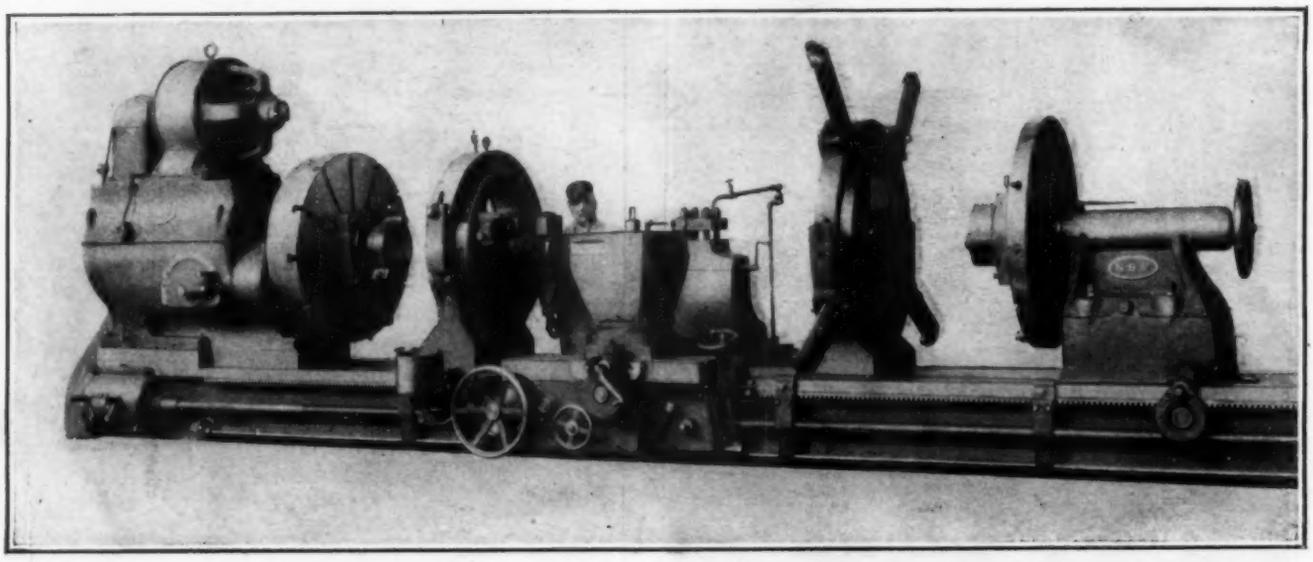
A motor-driven pump, set at the back of the bed, supplies cooling lubricant to flood the tools from a tank in the floor. When there is other work to be done, the special attachments may be quickly removed. The main driving motor is mounted on the headstock and controlled conveniently from the operator's position at the carriage. All other parts of the lathe are designed in accordance with Niles-Bement-Pond practice.

Norton Motor-Driven Grinding-Wheel Stand Type "S"

The Norton Company, Worcester, Mass., has added to its line, a motor-driven grinding-wheel stand suitable for heavy-duty work.

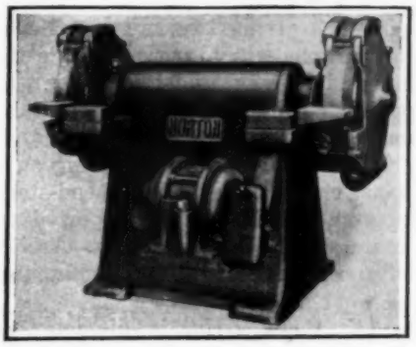
The feature of this machine is the built-in motor, mounted in the lower portion of the base on a pivoted platform, which permits an adjustment for the belt tension. The correct surface speeds for large and small wheels are provided for by means of two pulleys fastened on the spindle.

Combination protection and dust hoods, of a durable strength, hold



Niles-Bement-Pond Crankshaft Lathe, 48-in. Heavy Duty

SHOP EQUIPMENT NEWS



Norton Motor-Driven, Grinding-Wheel Stand-Type "S"

out the fragments of a broken wheel. These hoods are provided with hinged covers to facilitate wheel changes.

The work rests are large in size, easily adjusted and have a chilled finished surface to resist wear. They are easily removed for the grinding of large work.

This machine is made in 16-in., 20-in. and 24-in. sizes, constructed with a large bearing area on the floor, and sufficient strength and power to meet the usual working conditions.

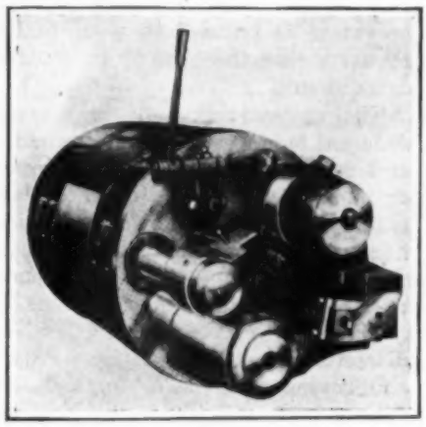


Fig. 3—The circular operating unit

Potter & Johnston Unimatic Chucking and Turning Machine

The unimatic is an addition to the line of automatic chucking and turning machines manufactured by the Potter & Johnston Co., Pawtucket, R. I., and is designed for continuous quantity production purposes. It is illustrated in Figs. 1 and 2 given herewith.

A circular unit, shown in Fig. 3, carried in an outer housing, encases the principal operating mechanisms, and is driven by an independent motor. This unit is removed by withdrawing six bolts and a retaining ring.

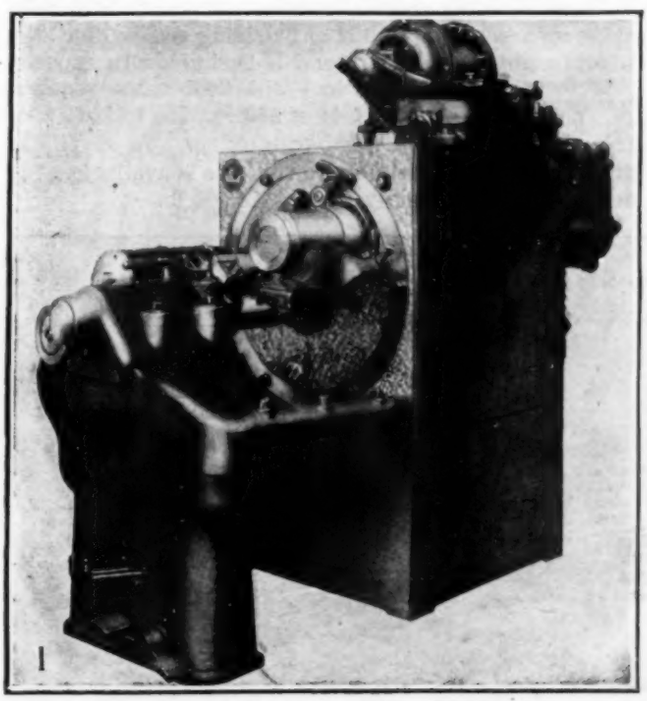
Alloy-steel gears and shafts are used throughout in the construction of the machine, and sliding surfaces are provided with hardened-steel parts for increased wear. The end thrust of the spindle, the side thrust of the turning slide and the end thrust of the facing arm are supported by ball bearings.

A chip pan surrounds the operating end, and the accumulated chips are brought through a passage under the body of the machine, so that their removal is made from the rear end.

Lubrication is provided by means of a pump mounted on the rear side of the machine. A tank for the cutting lubricant is cast integral in the base of the machine, and is designed to avoid unnecessary loss.

For machining work between centers, an air-operated center unit having a 2 in. movement is used, and for chucking work a 9 in. chuck, preferably air-operated, is recommended by the company.

Since the unimatic is built for quantity production, the speeds and feeds for boring, facing and turning are fixed according to the nature of the work. Speed and feed gears of the pick-off type are provided for obtaining a variety of cutting combinations. Idle movement during



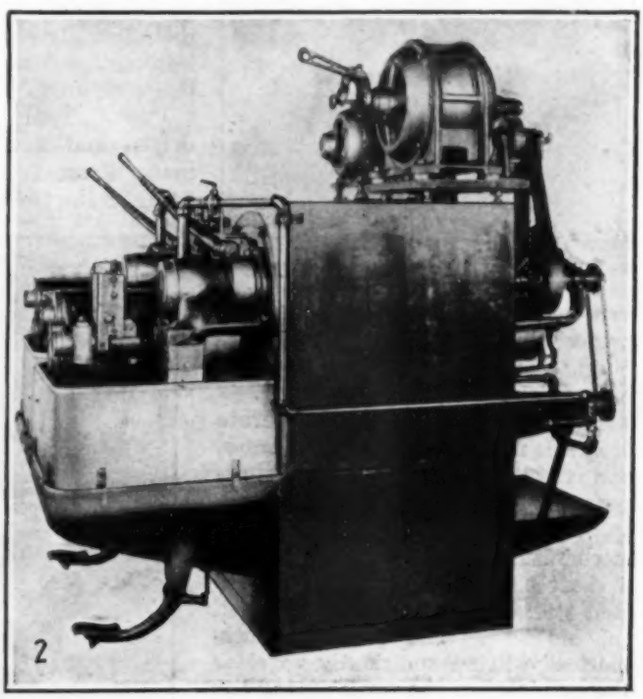


Fig. 1—Potter & Johnston Unimatic Chucking and Turning Machine. Fig. 2—Another view of the unimatic

SHOP EQUIPMENT NEWS

operation is reduced to a minimum by arranging the contour of control cams to suit.

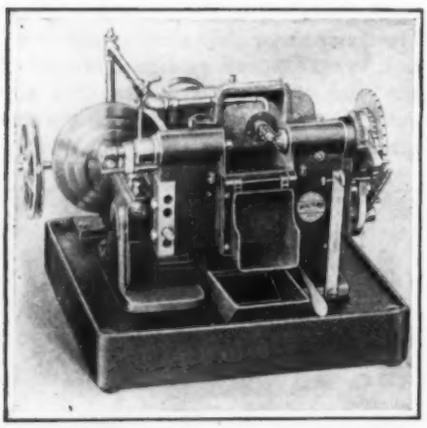
The unimatic is built in several different models to suit requirements and can be operated either singly or in batteries, as the outer casing is finished all over, allowing installation so that the distance between centers is 31¼ in. The floor space required is small, as may be seen.

The swing of the machine is 9 in. diameter, the travel of the turning and boring slide is 7⅛ in. and the facing travel of the swing arm is 4½ inches.

Waltham Automatic Pinion and Gear-Cutting Machine

The Waltham Machine Works, Waltham, Mass., has added a 1½-in. capacity, automatic pinion- and gear-cutting machine to its line, especially adapted for cutting watch, meter and gage pinions and sectors.

The cutting coolant is guided by a hood and hinged cover, so that the working parts of the machine are



Waltham Automatic Pinion- and Gear-Cutting Machine

protected, an individual pump supplying the coolant from a reservoir built in the base of the machine.

The spindle is designed to operate at speeds necessary for cutting brass, and is of sufficient strength for steel-gear work. Helical gears drive the spindle which is carried by a swing mechanism and is pivoted around a shaft containing the drive pulley. Belt strain on the spindle is avoided in this way. The swing is automatically lifted sufficiently to clear the cutter from the work during the return of the workslide after a cut has been completed. Adjustments for various sized cutters are made by stops on the swing.

A slide mounting for the cutter swing, permits adjustments in a direction at right angles to the work.

For producing work having fine teeth and small diameters, it is necessary to take two or more cuts for each tooth. Two or three cutters are mounted on the cutter arbor, spaced so that only one cutter is operating at one time. After the first cutter completes a full number of teeth, the slide is automatically shifted bringing the second cutter into position. If more than two cuts are required adjustments are made accordingly, so that the third cutter comes in contact with the work.

A worm-driven camshaft operates a lever, swinging on a fulcrum attached to the base of the machine. This lever may be connected in four positions giving two lengths of cuts for pinions which are cut single 0.4 in. and 0.65 in. and two for larger work or work in gang form of 1 in. and 1.25 inch.

The work is held by a spring on a taper chuck located in the head-stock spindle, or it may be supported on centers or in a taper socket. Arbors of special design can also be applied as work-holders.

The index, 5 in. in diameter, is timed to operate on the return stroke of the workslide during the time that the cutter is cleared from the work.

Standard cutters are ⅝ or ⅞ in. in diameter x ⅛ in. thick x ¼ in. bore. The base of the machine is 16½ in. long by 16½ in. in width. The weight is 195 lb., the weight of the countershaft is 47 lb. and the gross weight of the combined parts cased for shipment is 345 pounds.

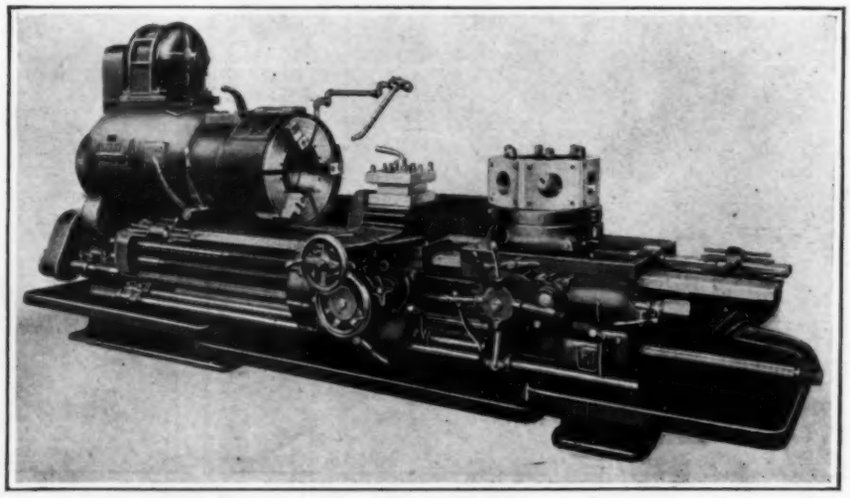
"Libby" High-Power Turret Lathe 26-In., Type C-12

The International Machine Tool Co., Indianapolis, Ind., have placed on the market a 26 in. "Libby" high-power turret lathe, type C-12, incorporating changes in the design of the headstock and the method of drive.

A single-pulley drive and an all-geared headstock are used, making this direct-drive machine an addition to the other models manufactured by this company.

Power feeds are positive-gear driven and necessary changes are made direct from the apron. The feeds of the turret and tool-post carriage are independent of each other, both as to direction and size. A force-feed lubricating system supplies ample lubrication for all main bearings.

The swing of the machine is 26½ in. over the ways and 24 in. over the carriage. Other dimensions include travel of turret, 72 in., hole in spindle, 12¼ in., driving pulley diameter, 16 in., and a boring depth capacity of 23 in. The floor space required is 114 in. x 230 in., the radial sweep of the bar is 57 in. A 35 ft. per min. rapid traverse is available. The net weight is 14,000 lb.



"Libby" High-Power Turret Lathe, 26 in., Type C-12

News of the Week

Labor Problems Are Discussed at the Metal Trades Meeting

Educating workmen is popular theme at annual session

The twenty-seventh annual convention of the National Metal Trades Association was held at the Hotel Cleveland, Cleveland, Ohio, on Wednesday, April 22. There were present 252 members.

Paul C. DeWolf of the Brown & Sharpe Manufacturing Co., and president of the Association, presented his annual report. He gave the results of a questionnaire sent out to establish a business survey, 464 reports having been received. To the question "How is Business," 15 reported very poor, 41 poor, 247 fair, 140 good, 13 very good and eight excellent. In reply to another question "What is the outlook for the next six months," 200 of this number reported that it was fair, 155 reported that it was very good.

He then dealt in turn with the few labor difficulties experienced during the year and the interest that is being taken in industrial engineering that is shown by the large demand for its text books on elementary machine shop practices. He also stated that a committee has prepared a volume on "Tool Making" and that it is now working on a training course for foremen.

In dealing with labor organizations, Mr. DeWolf stated that in 1910 there were approximately 18,263,000 wage earners in the country, while the combined trade unions membership was 2,101,502. In other words 11 per cent of the wage earners of 1910 were organized. Figures today indicate that about 16 per cent of the same class of employees of the country are affiliated with labor unions.

O. L. Smith's Address

Following this report O. L. Smith of Lansing, Mich., assistant Attorney General, gave an address on the activity of the Communist Party in America. The figures he presented were surprising, but he backed up each statement made by producing the actual evidence. He was not at all pessimistic about the situation, but pointed out that the activity of the Communists and the relation they have with the Soviet Government in Russia were subjects that should be brought forcibly before American leaders of industry.

The address that was of most interest to those mechanically inclined was that by Louis Ruthenburg, general manager of the Yellow Sleeve Valve Engine Works, Moline, Ill. The address will appear in a later issue.

There was a good discussion following Mr. Ruthenburg's speech. Alfred Kauffman of the Link-Belt Co. stated that industry, while being very simple in its elements, is also becoming more and more complex in its entirety. He also believes in educating foremen in the various financial details of the firm they are working for.

Henry Wiegand of the Cutler Hammer Manufacturing Co., Milwaukee, stated that in his company there was a foreman's organization that gets information about business, these being conducted by factory men on their own work. This course has been so successful that it has been extended outside of the foremen to the sales, engineering and cost departments.

Col. Dillard of the Cleveland Twist Drill Co. described how his company had adopted a course in foremen's training four years ago. This course is prepared by the executives and last year, for example, it dealt with industrial economics. Stereotyped and "canned" courses, he stated, should not be given and courses must be cut to suit the organization. Each month the production, sales and finance figures are gone over very carefully with the workmen.

In the evening a banquet was held. The principal speaker was Lieut. Leslie P. Arnold of the Air Service who detailed his experiences in the around the world flight. Lieut. Arnold paid great tribute to the planning organization behind the flight who laid out the routes, established the supply stations and saw that the spare parts were adequate. One little sidelight on the engine difficulty of the flight was described in his talk, where he stated that in Indo-China they took out one engine from the plane and replaced it in 71 hours. The plane was secured under a river bridge and the bridge was used as an overhead arch of a crane; block and tackle for the operation being suspended from the bridge.

A. G. Oehler Is Chosen President of the American Welding Society

Good attendance marks annual meeting held in New York

The annual meeting of the American Welding Society was held in the Engineering Societies Building, 29 West 39th St., New York City, April 22 to 24. The morning of Wednesday was devoted to meetings of the Resistance Welding and Gas Welding Committees. In the afternoon the Electric Arc Welding Committee met and in the evening the Educational Committee discussed plans and ways and means for carrying them out.

On Thursday morning the annual business meeting was held. It included the usual reports and the announcement of the election of officers as follows: A. G. Oehler, New York, president; George Bird, Atlanta and C. S. Smith, San Francisco, vice-presidents; James Burke, Erie; Jos Meadowcroft, Philadelphia; S. W. Miller, New York; and H. A. Woofter, Lynn, Mass., directors-at-large.

In the afternoon more than eighty of the members visited the Bay Way Plant of the Standard Oil Co. of New Jersey where various applications of welding were inspected. In addition, a chance was afforded to see how oil refining is carried on in a large plant.

The fourth annual dinner of the Society was staged at the Park Avenue hotel Thursday evening and was attended by more than 100 members and guests. T. A. Wry of the General Electric Co., vice-president of the Society, acted as toastmaster. He called on the past-presidents who were present to make informal remarks on the early struggles of the Society and the developments of the last year or two. Prof. C. A. Adams of the Harvard Engineering School, the first president of the Society, said that in his opinion the research work instituted and carried on under the direction of the American Welding Society had produced more important results than similar activities on the part of any one of the older national societies. The retiring president, Eric H. Ewertz, general manager of the Moore Plant, of the Bethlehem Ship Building Corporation, laid particular stress on the smoother working of the Society during the past year and congratulated the members on a successful experiment in co-operation between the different branches of the welding industry that was resulting from their efforts.

Friday, from 9:30 o'clock in the morning until two o'clock in the afternoon, was given over to the technical session of the meeting. It consisted of a symposium on two subjects, "Methods of Inspecting Welds," and "Testing the Skill of Operators." Short papers were offered by about thirty experts in the different branches of welding and valuable discussion followed. A meeting of the American Bureau of Welding took place at two o'clock and was followed by the organization meeting of the board of directors at 3:30 o'clock.

Pittsburgh Machine Tool Show Attracts Many Industrialists

Motch & Merryweather company stages interesting exhibit

Carrying on with the idea of taking machine tools to the buyers, the Motch & Merryweather Machinery Co. held an exhibition of machine tools in its Pittsburgh office, 130 Seventh St., from April 17 to 25 inclusive. The exhibition was open from 10 a.m. to 10 p.m. and included the following machine tools, all motor driven:

American 4-ft. "Maxi" ball-bearing radial drill.

American 16-in. self-contained motor-driven lathe.

Baker No. 424 heavy column-type drill.

Bullard 8-in. "Vert-Au-Matic."

Cincinnati 8-in. saddle-type, self-contained cylindrical grinder.

Cincinnati No. 2-CM milling machine.

Cochrane-Bly No. 66 metal sawing machine.

Cochrane-Bly No. 11 saw sharpener.

Giddings & Lewis No. 32 horizontal boring, drilling and milling machine.

Giddings & Lewis No. 150 portable universal radial drill.

Gould & Eberhardt 32-in. "Invincible" shaper.

Keller R-6 tool grinder.

Keller BK portable flexible-shaft grinder.

Ransom direct-motor-drive ball- bearing grinder.

V & O No. 2½ inclinable power press.

Each machine exhibited was in charge of a representative of the builder, who was thoroughly familiar with its operation and who took special pains to see that every visitor secured all the information he desired. Every exhibitor seemed fully satisfied with the results for, as several expressed it, "we haven't had crowds of curiosity seekers, but a good representative attendance of men who are responsible for production and who specify the kind of machines to be bought."

The various machine building industries from the whole surrounding territory were well represented, and by general managers, shop superintendents, general foremen and others of the executive staff. The large electrical and air brake industries, the steel mills, pipe mills, gas engine builders, makers of air compressors, oil well supplies and other lines, were also represented.

Most of the machines were in operation on actual work. In one case the work was sent in by local manufacturers to see what could be done with material that they had been unable to handle satisfactorily in their own shop. The machine shown cut the 70 point carbon steel, plus some chromium and nickel alloy, to the satisfaction of all concerned.

The visitors all expressed satisfaction with the machines exhibited and appreciated the opportunity of seeing them at work. Assuming that these visitors represent a cross-section of industry in the Pittsburgh district, the outlook is better than for sometime, it was stated. Several of the industries represented reported business much better and a number are working overtime or with night shifts to meet delivery dates. These represent a variety of products and the reports are more encouraging on that account.

In addition to the machine tools, there was an interesting display of the small tools handled by Frank T. Donnelly, at the same address. These included milling cutters, boring bars, taps and special cutters of different makes.

F. L. Kohlhase Heads Chicago Club

F. L. Kohlhase of the National Stamping & Electric Works, Chicago, has been elected president of the Chicago Machinery Club succeeding H. S. White of the Cleveland Twist Drill Co. The annual meeting of the Club was held April 21 and was attended by a large delegation of the members. The other officers elected were as follows: R. W. Barry, vice-president, the Drying Systems, Inc.; H. S. White, secretary, the Cleveland Twist Drill Co.; H. F. Kempe, assistant secretary, H. F. Kempe & Co.; H. J. Reeve, treasurer, the Reeve-Fritts Co. The new governors elected were; F. L. Kohlhase, H. F. Kempe, R. W. Barry, and H. H. Brettman, assistant cashier of the Mercantile Trust and Savings Bank.

There were 140 in attendance at the annual meeting and dinner, this being the largest number that ever attended one of these meetings. The retiring president, H. S. White, spoke of the developments of the Club during the past year and commended the committee members, as well as the Board of Governors for the hearty co-operation that they had rendered.

At the conclusion of the talk, F. A. Adkins presented to Mr. White, in behalf of the Board of Governors, a beautiful solid gold wrist watch as a token of esteem for the faithful service rendered during the past year.

Meeting of Detroit Section of S. A. E.

A meeting of the Production Division of the Society of Automotive Engineers, Detroit section, was held Thursday, April 16. A series of papers on sheet metal was read.

The gist of these papers was that there are no specifications available for the purchase of sheet metal in accordance with requirements.

The first speaker, F. R. Pleasanton of the J. W. Murray Manufacturing Co., enlarged on a series of tests that were made on over 300,000 sheets to determine the adequacy of the Olsen ductility test to determine the most suitable Olsen figure for deep pressing purposes. The range in this number of sheets ran from 0.301 to 0.489. By actually pressing it was demonstrated that a range of 0.390 to 0.410 was most advisable and with an increased range of 0.375 to 0.425, 90 per cent of the sheets would pass inspection and use.

In addition Mr. Pleasanton stated there was a rejection of 12.73 per cent of sheets due to milling defects, such as broken grain, open surface, pits and roller levelling marks. In discussing the subject further, he added that a proper technology of the subject of sheet metal should be developed and that it is urgently needed, because we are at present at the end of "rule of thumb" methods.

He defined the stamping of sheet metal as consisting of establishing a form, the dimension desired, and then stretching the material while in a plastic stage over this form, then removing the form, allowing the material to retain its shape. This definition evolved the theory, which was corroborated by practice, that one of the most important characteristics of sheet metal suitable for stamping is that there should be a sufficient spread between the elastic limit and yield point and the ultimate tensile strength.

This was also brought out by another speaker, E. F. Collins of the Packard Motor Car Co., who used Ericsson tests in connection with Rockwell hardness tests, finding that the ratio of the elastic limit to the tensile strength should be between 50 and 60 per cent.

John McGeorge of the Oakland company and Mr. Condy of the Duco company, also spoke on the surfacing of sheet metal to take the new pyroxylin finish, such as is used on bodies. The most important characteristic is that the surface should be perfectly clean and that the sheets must be smooth and clean to start with and must be kept smooth and clean during fabrication. The natural surface is best not only for pyroxylin finish but for all paints—it is not desirable to produce a mirror finish.

Ohio Foremen Announce Annual Meeting

The Ohio Federation of Foremen's Clubs will hold its annual convention this year on May 13 at the National Cash Register Co.'s schoolhouse, Dayton, Ohio. At the convention last year there was an attendance of about 400 superintendents and foremen from forty industrial centers in Ohio. These men represented over 150 industrial organizations.

At this year's meeting an attractive program has been arranged with addresses by the Federation's president, Thomas B. Fordham, works manager of the Delco Light Co., William Hartman, superintendent of the National Cash Register Co., J. O. McKinsey, of the Frazer & Torbet Co., Chicago, Ill., and W. C. Mattern, superintendent of the Crawford, McGregor & Canby Co., will be delivered. In addition to these and other matters of business to come before the meeting, there will be pleasure drives, factory inspection trips, reports of officers, and addresses by James J. Davis, Secretary of Labor, and others.

Economic Conditions in Switzerland Show Gradual Improvements

Difficult position of war-border country since the armistice

By Special Correspondence

IF YOU would look at the official statistics of unemployed in Switzerland, you would think it must be a country of wonderful prosperity. It shows one of the lowest ratios of unemployed in proportion to the whole population.

On the other hand, there are only a few industrial shares quoted on the stock exchanges that are above their par value and fewer still that hold the same level that they did prior to the war considering all factors, such as the rise in the general index and new issues.

I will not discuss the conditions on which the statistics are based. I only want to mention that these principles as well as the laws concerning allocutions to unemployed—and only this part of out-of-work-labor is considered by the statistics — underwent important changes during the last years, so that the figures have only a relative significance and are not even comparable by themselves.

With few exceptions, Swiss industries have passed since 1920 the most serious crisis they ever had to face. Some of the principal customers became so impoverished that they closed the frontier for most of the Swiss export articles; silk, embroideries, watches, chocolates and other things qualifying them as "luxury articles." Other pre-war export products such as aluminum, carbide, chemicals, dye-stuff and lorries are now produced abroad in large quantities by native industries and protected by prohibitive tariffs.

The standard of living is much higher than in other continental countries and accordingly wages keep at a high level, almost three times more than those in the rest of Europe with its depreciated currencies.

High Taxes

The tax burden is equally high. The war cost that has resulted from the guard of the frontiers on all sides, the deficits of the Federal Government as well as these of the municipalities and the various States, are all charged against the tax-payer.

The 48-hour week is strictly enforced in public and private enterprises. There were granted, however, some extensions to 52 hours to enable competition with foreign countries.

To complete the circle, there has to be mentioned the high freight rate resulting from the huge deficit accumulated by the Swiss Federal Railways during the war. Coal prices soared to ten times pre-war quotations and the difficulty or impossibility to get a sufficient supply, the absence of all transit and tourist travel, and the beginning of the installation of electrical traction during the period of highest prices added to the plight. The prices of raw materials—Switzerland has to import over 90 per cent of them—is raised by the long and costly transport, besides being higher for other reasons.

Some of these liabilities on Swiss industries have existed ever since the War, but there must be some assets or industry would not occupy the prominent place it does to-day in Swiss economic life. The foremost is and always has been Swiss workmanship. Switzerland never can compete in quantity, but the quality of its products is so high that even under the aforementioned aggravating circumstances, the hope for a better future is justified.

Germany, the chief competitor, has enlarged and improved its plants during these last years without cost, these as well as older debts being wiped out by the breakdown of the old mark. The newly established "gold-balances" include ample reserves. Most of them, if not all, were made up so that a dividend of 10 per cent can be paid which would raise considerably the market price of the shares and on this high level a new issue of common stock becomes possible. This means that the high dividend rate will not be maintained for a longer period.

German industry needs capital badly, and as it will not get it in Europe by loans and credits, issuing stock is the only practical way.

Swiss industry recognized the changed conditions in time. Most of the corporations had to show heavy losses in their balances due to investment in countries with depreciated currencies, to the impossibility to export, and consequently to the fall of the turnover to such a low point that neither overhead nor even factory expenses could be covered.

Some of the industries that suffered most in the crisis, such as watchmaking, had to be supported by large government credits. The electrification of the railroads during this critical time is also to be considered from this point of view.

In many instances, competition increased because a number of new plants were erected during the war and many of the old ones enlarged at considerable expense. Though labor-saving devices are used, there is a limit because of the type of products. Most of them are custom built and therefore cannot be standardized to the same extent as mass products can. The mentality of labor would not tolerate too high a specialization because of its monotony.

Unionism is quite strong in Switzerland and public opinion is rather in favor of it.

The corporations on the other side have taken a new start and have made a general clean up. The heavy losses were removed from the balances and financial and technical reorganization took place. Many of them, however, have transferred the manufacturing part of the enterprise into countries where manufacturing costs, especially labor, are cheaper. Only the general offices remain at their old place.

The progress of protective tariffs all over the world accelerated this course. So we see just now some of the oldest Swiss industries settling down in Germany near the Swiss border or in the United States. Other industries that had already subsidiaries abroad are going to enlarge them considerably, thus reducing actual manufacturing in their home country. How this will eventually influence the economic condition of Switzerland is problematical.

Sounder Economic Conditions Found by Industrial Conference Board

More work, better pay and lower cost of living are reported

Steady advance toward better and sounder conditions in industry and business generally is revealed by the monthly report on wages, hours and employment for February, complied by the National Industrial Conference Board, New York City.

Encouraging and significant, it is pointed out, is the fact that while employment continues to increase, even though very gradually, it has done so simultaneously with a noticeable decrease in the cost of living.

Average employment during February increased from 77.6 to 78.9 as compared to 100 in June 1920, equivalent to an 1.8 per cent increase over the preceding month. With the purchasing power of the dollar climbing, as reflected in the 1.1 per cent drop in living costs during February, together with a slight increase of average weekly earnings of 3 cents, from $27.09 to $27.12, the net result to the wage earner was an average increase in "real" earnings of about 1¼ per cent for the month. The Conference Board's Cost of Living index number for March shows no change from that of February, remaining at 165.3.

Noticeable gains were also recorded by the metal trades industries generally, especially in the manufacture of automobiles, where employment during February increased from 60.6 to 64.1, as compared with 100 in June 1920, average weekly earnings from $30.64 to $31.60, and average working hours from 47.1 to 48.8 hours per employee. Greater activity in the foundries and machine shops during February is indicated by increase in employment from 75.2 to 76.5 as compared with 100 in June 1920, a gain in average weekly earnings from $28.55 to $28.73, and an increase in average working hours from 48.4 to 48.7 hours per man. Increase of activity in the latter industry, reflected in increased working hours and weekly earnings, is regarded as noteworthy.

A shortage of skilled molders and coremakers is reported to the National Industrial Conference Board.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

THERE is more justification for optimism in the business outlook than at any time since the election. But it is not the sort of optimism that is born of the expectation of higher prices and speculative buying. It is the optimism that is engendered by the need of buckling down to the hard work, the persistent effort and the painstaking enterprise by which, and only by which, competition can be met, and prices so reduced that our somewhat excessive production will be brought within the purchasing capacity of the people.

Some time since a medical magazine published an article extolling the "curative value of hard work." As a remedy for most human ills work was recommended as far ahead of any drug in the pharmacopœia, and the recommendation could have been safely extended to include the disorders of the business organism as well as those of the physical body.

Last week this letter contained a reference to some complaints that President Coolidge was injuring business by advocating economy. One of the complainants was former Governor Henry J. Allen of Kansas, who was quoted as saying "there is another small-sized buyers' strike on." Others less prominent have since expressed themselves in the same sense and some of them now claim that there is a discernible curtailment in retail buying. This is doubtful. It is not indicated by any statistics that are as yet available, but there is some evidence that people feel that a reduction in the cost of living is overdue and that unless they can soon buy cheaper they will buy less.

This attitude is not regrettable for it bespeaks the thrift that makes for real prosperity and there are signs on every hand that manufacturers are making ready to meet it by reducing the cost of production in every way possible. Such a policy may for a time restrict the output, but it will increase consumption in the end and so put American industry in a position to work at capacity and sell the resulting production at a fair profit.

There is, for instance, a sharp reduction in building activity, but architects and contractors both say there will be plenty to do when costs come down. The same thing is true of the textile industry. Hand-to-mouth buying of both woolen and cotton goods persists, but the best informed merchants say that stocks are small and that they would be speedily replenished at any decline in prices.

In the steel industry increased buying seems to wait on lower prices and a further curtailment in production is reported. Copper and the other metals are in much the same case.

There has been some gain in the number of automobiles manufactured, but the total is still behind last year and new cars are slow of sale.

The grain markets have fluctuated somewhat aimlessly. The course of prices will be determined by the weather, but for the present it seems impossible to revive speculation in wheat, corn or rye. Sugar is a little lower on estimates that put the Cuban crop at 4,900,000 tons. This may be 500,000 tons in excess of the consumption but such a carryover will not be burdensome if the low prices increase consumption and reduce next year's production as expected. Coffee continues to yield under the gradual liquidation of the stocks held in Brazil, but tea has had quite a sharp advance. The other commodities have not changed much, but the New England shoe manufacturers are complaining and many of the unionized coal mines are having a very difficult time.

On the Stock Exchange there has been some unsettlement caused by the decline of U. S. Cast Iron Pipe and certain other speculative securities whose holders have overstayed the market. In stocks as in grain the bull movement appears to be entirely over and the chance of reviving it is minimized by the debate about renewing the charters of the Federal Reserve Banks that has been precipitated by Secretary Mellon's article in "The Nation's Business." These charters have still nine years to run but Mr. Mellon urges their renewal at the next session of Congress lest it may be difficult to obtain later on if a depression in business should supervene.

The weekly statement of the Federal Reserve System shows a reserve ratio of 76.5 per cent and the other important items all indicate continued monetary ease. All the capital that legitimate business may require is therefore available and with a stable price level those who understand their business ought to make reasonable profits if they work hard enough.

The foreign outlook is also quiescent. All Americans will hope that Caillaux may be able to lead France out of the quagmire of debt in which she is sunk, but his task is a difficult one and handicapped as he is by his past his success will be almost a miracle. The result of the German elections on Sunday is awaited with keen interest. Rightly or wrongly it is taken for granted in this country that the victory of Hindenberg would mean a return to the militaristic regime in Germany and that France would feel compelled to again arm herself for war.

Sterling is up to 4.80½, the highest price of the year. It is believed that on Tuesday the British Government will announce the re-establishment of gold payments as of Jan. 1, 1926. This is another step toward normalcy and for that reason it is encouraging, although it may ultimately mean lower prices as expressed in terms of gold.

What's Doing in Industry

The month of April proved to be better than was anticipated in the machinery and machine tools markets of the United States. During the first two weeks business was quiet, but the last two weeks in most sections have made up for this non-activity and orders for the month will be only a trifle behind those of March which was the best month of the year. Some sections are reporting that April will be the leader for the first four months, while other sections — notably Buffalo and New York City—have been unable to report anything so optimistic. Milwaukee, Cincinnati, Detroit and New England, however, claim a notable strengthening during the past thirty days.

Automobile makers have been the best customers during the past two weeks with general industrials and the big electric companies contributing their share. Agricultural implement builders, some of them reported to be working day and night, have also bought generously in the Chicago and Milwaukee districts.

The railroads, usually very good customers of the machine tool builders, did not enter the market except for necessities. No large lists were issued by any of the roads during the month.

Exporting is still gaining and this business is proving to be remarkable from every standpoint. Germany and Great Britain are the best customers with Italy, Spain and France trailing.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Detroit

Sales in the machine tool and machinery fields in Detroit and the other automobile centers of Michigan remain at practically the same level as those for last week, and give every promise that April will rank among the best months the industry has known here for some time.

Inquiries for special machinery are coming in to local houses in larger numbers, while the demand for standard machines has experienced no decline during the past few days.

The Fisher Body Corporation has practically completed alterations in the former plant of the Mansfield Steel Co. in Detroit and is now using it for manufacturing all of the metal stampings used by Fisher in the Detroit district.

Plants throughout the state report greater activity. The Auto Body Co., Lansing, has contracted with the Locomobile Co. of America to build phaeton bodies for the new Junior eight and six chassis. The metal working plants of Grand Rapids are the busiest in months. At Flint, the Chevrolet plant is running at practically full production, while the Buick plant is gradually increasing its output.

Chicago

Industrial inquiries, which for a time promised to develop into a fairly active demand, have slackened somewhat, but the belief is voiced that manufacturers employing machinery to carry on production of large volume must soon come into the market for needed replacements.

A review of manufacturing conditions throughout Illinois shows that in most cities manufacturing plants are keeping up with orders without having to increase their working forces. Rockford is an exception, the report from that city being to the effect that woodworking, tin can, and metal and machinery plants are operating overtime.

The most encouraging feature of the present situation is found in farm machinery and equipment production which, for the first time in four years, makes it necessary for plants to operate night and day to keep up with orders.

Business being done by dealers in machine tools is susceptible of considerable improvement, but occasional orders coming from railroads and automotive plants, together with the industrial demand, serve to save the situation from depression. The Western Electric Co. has bought automatic screw machines to an amount approximating $100,000 within the last few weeks.

Nothing new has developed in the railroad situation, and dealers still are expectantly awaiting the awarding of contracts in which they are interested. In this connection, it is announced by the Chicago Milwaukee & St. Paul Railway that bids for 3,000 box cars, 1,500 stock cars and 1,000 auto cars, involving an expenditure of approximately $10,000,000, will be opened about May 1.

Cincinnati

A fair volume of business during the past week is reported by Cincinnati's dealers and manufacturers of machine tools. The demand has been of a more even nature than in previous weeks, with an absence of "spottiness."

An increased number of inquiries are reported, these coming from diversified lines and from all parts of the country. The general industrial conditions, it is judged from these inquiries, are slowly but surely getting better.

As it is, it is pointed out, business conditions are now fully twenty per cent better than they were in the corresponding period of last year. A noticeable feature of the past week was a further increase in the demand for replacement parts, indicating greater activity among users of machine tools in various lines of manufacture.

There has been an increased demand from the automotive industries. Representatives returning from Detroit and other centers of automotive manufacture report good business with prospects of more to come. A few orders came from the textile industry, but the demand from this source is not yet up to normal.

Railroads are still sending in inquiries, but they have not begun to purchase freely and are only buying necessities. A number of inquiries have come from foreign countries, but the volume of export business has made no material gain.

Southern District

Though machine tool, equipment and mill supply sales in the Southern territory do not seem to have experienced any improvement during the last two weeks, business is nevertheless holding its own, dealers stating that April sales have been as large as any previous month of the year, and that May business gives promise of running on about the same basis.

Not a great deal of buying is being done by existing industries with one or two exceptions, but there is reported to be a very good business in sales to new plants that are being established in all parts of the Southeast.

As road work progresses throughout the South there is still a fair volume of sales reported to road building contractors.

Smaller shops are buying used equipment to some extent, while service station business is reported very good, largely in used and rebuilt tools.

Southern railroads, however, still lead the field among the active buyers of new equipment, with good business reported in Atlanta from nearly all parts of the South. A number of important new shop and terminal projects were announced by Southern roads in April, and the total involved in such work now in progress in the Southern states amounts to several million dollars. Inquiries from this source are active, portending no let up in this business in the immediate future.

Philadelphia

Although declines in production have occurred in many industrial lines in Philadelphia, there are several good points in the situation, as viewed by industrialists and economists. In various branches of industry there is sharper competition now than there was a year ago, yet in many financial statements better earnings are reported than appeared in the reports of this time in 1924.

Many manufacturers have curtailed their production to actual current needs. There is little if any production for future buying. In the machinery and machine tool lines there is nothing to indicate an early buying period. A hopeful feeling pervades the machinery dealers, however. This is based upon the theory that eventually business again will resume its stride. How soon this will be, none would venture an opinion.

The current readjustments in manufacturing are not surprising, and are on line with forecasts made at the time of expansion. They show that outputs have exceeded consumption by a considerable headway, and that demands have not increased to the extent anticipated by many.

With adequate supplies readily obtainable in most instances, there has been no incentive to buyers to operate very far ahead. The easing of prices has accentuated the disposition to limit orders chiefly to immediate or nearby needs.

Milwaukee

Manufacturers of automobile units, parts and equipment are experiencing the beneficial effect of the substantial increase in the production of passenger cars in the past few weeks, and their specifications will carry them well into June at the present high rate of output, which is only a small percentage under the peak reached in the spring of 1924. This situation has resulted in taking up the slack in employment so far as skilled labor is concerned, and has assisted materially in relieving the excess of semi-skilled workers. Common labor appears to be plentiful, but the

building trades are rapidly absorbing the supply.

There is unmistakeable evidence of improved conditions in the foundry and machine shop trades generally, and more men are at work at the close of April than in March. There has been a succession of small, but gratifying gains for at least six months past, without a single month in which a decline from the previous month has been reported.

In addition to the help given by the automobile trade in bringing up the rate of shop operations, the agricultural implement industry, including tractors, deserves considerable credit. Milwaukee is a large center of farm machinery production, and these shops, as a rule, are now operating at the highest rate in more than four years.

New York

An improvement in business was noted in the New York district during the past week and the month of April will finish with a good volume of business, although not equal to that of March, due to the dearth of orders during the first two weeks.

Railroads were in the market this week with both inquiries and orders. Sales are recorded to the Lehigh Valley, the Lackawanna, the New York, New Haven & Hartford and the New York Central, with inquiries from the Pennsylvania, the Erie and several Southern railroads.

General industrials were in the market and the big electric companies were also buyers, but to a limited degree.

Exporting showed further improvement with prospects bright.

The outlook for May is the best for this season of the year that has been experienced since 1920. Inquiries should bring forth many orders and will probably keep the average well up with the first four months of the year.

Business Items

The New York address of the National Acme Co., Cleveland, is 350 Broadway, Room 506.

Carels Brothers, Ghent, Belgium, have been granted the right to manufacture the Ingersoll-Rand solid-injection type of oil engine.

The thirtieth anniversary of the establishment of George Rahmann & Co., 31 Spruce St., New York City, was celebrated by a dinner at the Machinery Club on April 14. Service pins were presented to the older members of the organization.

The merging of five manufacturing companies—two in Chicago, two in Elkhart, Md., and one in Watertown, Wis.—has been announced. The new corporation, to be known as the Monarch Industries, Inc., will be located in Elkhart. The companies in the merger are the Monarch Tractor Co., Watertown, Wis.; Monarch Radio Corporation, Chicago; Krasco Manufacturing Co., Chicago, and the Foster Machine Co. and Foster-Johnson Reamer Co. of Elkhart.

Obituaries

GEORGE MESTA, 63 years old, president and director of the Mesta Machine Co., West Homestead, Pa., died in the Ritz-Carlton Hotel, New York City, April 22. In 1886 he was engaged as engineer with Totten & Co., Pittsburgh, in designing engines and rolling mill machinery. In 1887 he organized the Leechburg Foundry & Machine Co. and became vice-president and general manager of the company. In 1889 he was elected president of the company. In 1898 he organized the Mesta Machine Co., became president and started the building of the present plant at West Homestead. In the latter part of 1898, the Mesta company purchased the plants of the Leechburg Foundry & Machine Co. and the Robinson-Rea Manufacturing Co. Mr. Mesta was a member of the American Iron and Steel Institute, American Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers, the National Association of Manufacturers and Engineers Society of Western Pennsylvania, the Duquesne Club, Country Club, University Club, Pittsburgh Athletic Association and Automobile Club, Pittsburgh, Oakmont Country Club, Oakmont; Engineers Club, Machinery Club and Bankers Club, New York City; Congressional Country Club, Chevy Chase Club, University Club and Pennsylvania Society, Washington, D. C.

ADOLPHUS OTTO BACKERT, president of the Penton Publishing Co., Cleveland, Ohio, died Saturday, April 25, at his home in Cleveland. Mr. Backert had been a lifelong resident of Cleveland having been born there Feb. 3, 1876. He entered the employ of the Penton company in 1900 as associate editor of the *Iron Trade Review* and *Foundry* with headquarters in Pittsburgh. In 1906 he became Western editor of *Iron Age* with headquarters in Chicago, but in 1908 he returned to the Penton company as editor of *Foundry*. Later he was also made engineering editor of the *Iron Trade Review* and finally, editor of the paper. He is the author of many books upon technical subjects. He was prominent in the American Foundrymen's Association, the Foundry Equipment Manufacturers' Association, the American Iron and Steel Institute, and the engineering societies.

ASA M. MATTICE, aged 72 years, died April 19 at the Engineers' Club, New York City. Mr. Mattice had been connected with many important industries since his graduation from Annapolis in 1874. Following several years as a teacher at the Naval Academy, he became the assistant to Admiral Melville in the early designs of machinery for the Navy. Later he was connected with the Calumet & Hecla Co., the Westinghouse Electric & Manufacturing Co., the Allis Chalmers Co., and the Walworth Co. Since the World War he has been connected in an advisory capacity with the Remington Arms Co. He was a member of the A.S.M.E., the American Society of Naval Engineers, and the Engineers' Club of New York.

HARRY TAYLOR GAUSE, president of the Harlan & Hollingsworth Co., Wilmington, Del., until his retirement several years ago to devote himself to literary work and scientific research, died at his home April 22.

WILLIAM P. BROWN, aged 75 years, a pioneer in the foundry and machine shop industry of Racine, Wis., died April 10. He was born in Racine and in 1886 founded the Davis & Brown Iron Works, later establishing the Racine Malleable & Wrought Iron Co. From 1908 until 1913 he conducted the Elgin Brass Foundry Co., Elgin, Ill., retiring from active business 12 years ago and resuming his residence in Racine.

RALPH C. DAVISON of the American Abrasive Metals Co., New York City, died April 16 at his home in Plainfield, N. J. He was a member of the American Society of Mechanical Engineers.

ALFRED L. LOVEJOY died April 6 at his home in Greenwich, Conn. He had been the manager of the New York district for the Pratt & Whitney Co., Hartford, Conn., for the past 12 years.

C. W. ELLIS, New York representative of the Reynolds Electric Co., Chicago, died April 8 following a three-day illness. He had been in charge of the Eastern territory for more than six years.

Personals

P. D. CARR, of the sales department of the Cincinnati Planer Co., has been transferred to Pittsburgh, going with the Motch & Merryweather Machinery Co. who represents the company there. His activities will be mainly in the Philadelphia territory. This change does not remove Mr. Carr from the Cincinnati Planer Co. organization.

JOHN P. CASE has been appointed general manager of sales for the Brown Hoisting Machinery Co., Cleveland, succeeding E. C. PIERCE.

J. T. ROGERS of the Henry & Wright Manufacturing Co., Hartford, Conn., has returned from a business trip to Germany.

W. C. GARIGUES, former chief engineer and recently sales manager of the Williams Foundry & Machine Co., has resigned to join the Reynolds Machine Co. of Massillon, Ohio, as chief engineer of the tire mold division.

C. M. ALLEN, formerly of Elizabeth, N. J., has been elected president of the Garford Motor Truck Co. of Lima, Ohio. He succeeds E. R. CURTIN, resigned. The new president was formerly associated with the Autocar Co. of Ardmore, Pa.

WALTER H. FLYNN, for 13 years superintendent of motive power of the Michigan Central R.R., has been named superintendent of motive power of the New York Central Lines.

PAUL ANDREE, who has been connected with the Root & Vandervoort Motor Co., in East Moline, Ill., and Cincinnati, Ohio, has joined the organization of the Hoefer Manufacturing Co., Freeport, Ill.

FRED C. HERMANN has resigned from the organization of the Dale Machinery Co., Chicago. He has been identified with the machinery and machine tool industry for more than 20 years.

W. E. DUNHAM, recently in the motive power and machinery department of the Chicago & North Western Railway Co., is superintendent of the car department of the same company at Chicago.

GEORGE N. VAN DERHOFF, with the Dodge Manufacturing Corporation, has gone from the New York office to the office at Mishawaka, Ind.

PAUL BASTIEN has joined the Stutz Motor Car Co. of America as an aid to the chief engineer, CHARLES S. CRAWFORD.

A. E. BERDON has been made assistant chief engineer of the Eisemann Magneto Corporation, Brooklyn. He has formerly been connected with the Remy Electric Co. and Dodge Brothers.

MARSHALL T. JONES of Montclair, N. J., has been appointed assistant chief of the Iron and Steel Division of the Bureau of Foreign and Domestic Commerce.

PAUL M. TYLER, who resigned as chief of the Metals Division of the U. S. Tariff Commission a year ago to engage in private business, has been re-employed by the Commission as an expert in the same division. F. M. LEONARD remains acting chief of the Division. Mr. Tyler will assist in the investigation into costs of production of magnesite which has been reopened by the Commission, and in other work of the Metals Division.

L. A. LEISSLER is temporarily in charge of the New York office of the Reynolds Electric Co., Chicago. His headquarters are at 129 W. 31st St.

HENRY J. FULLER, of Aldred & Co., has been elected president of the Rolls-Royce Company of America, Inc., succeeding L. J. BELNAP, resigned. Mr. Fuller will also remain chairman of the board. W. L. Wright, president of Savage Arms Co., has been elected a director.

GEORGE F. RAND of Buffalo, and LESTER WATSON of New York, have been named additional directors of the Pierce-Arrow Motor Car Co., Buffalo.

H. N. MEEHAN, Birmingham, Ala., has been named to direct the preliminary details for the holding of a machinery exposition at Birmingham next September, at which time it is expected to have machinery on exhibition made by plants in all parts of the United States. It is planned to make the exposition one of the largest of this nature that has ever been held in the South.

W. T. MCLEOD and associates recently have formed the Spartanburg Mill Supply Co., Spartanburg, S. C., with $100,000 capital, for the distribution of tools, machinery and various mill supplies in the Carolina territory.

WALLACE CLARK, a consulting mechanical engineer of New York City, and W. H. LEFFINGWELL, president of the Leffingwell-Ream Co., New York, have been added to the Committee on Patent Procedure.

German Government Aids Machinery Builders

Special credit facilities are being extended to machinery manufacturers in Germany and other steps taken to encourage the export of that class of goods, information reaching Washington indicates.

The German policy is based on the fact that machinery represents relatively large proportions of German brain and German labor, whereas a small amount of raw material is involved. This is held to be highly preferable to the export of coal which hastens the depletion of that valuable resource.

Calendar of Local Meetings

American Society of Mechanical Engineers

Cleveland, May 4. Fairmount Pumping Station at 4 p.m., with a dinner at the Case Club at 6 p.m. "The Operation of the Modern Municipal Pumping Station," L. A. Quayle. C. D. Zimmermann, secretary, the Cleveland Electric Illuminating Co., E. 70th St. Station, Cleveland, Ohio.

Cincinnati, May 7. "District Organization of Modern Apprenticeship," H. A. Frommelt. Prof. J. T. Faig, secretary, the Ohio Mechanics Institute, Cincinnati, Ohio.

Hartford, Conn., May 7. Joint meeting with Meriden and New Britain sections. "The World's Economic Conditions," G. A. O'Reilley. C. W. Mayott, secretary, the Hartford Electric Light Co., 266 Pearl St., Hartford, Conn.

Detroit, May 9. "European Conditions," H. M. Lane. C. J. Oxford, secretary, the National Twist Drill & Tool Co., 6522 Brush St., Detroit, Mich.

Baltimore, Md., May 13. "Recent Developments in Pulverized Coal as Fuel," R. K. Neade. Prof. J. C. Smallwood, secretary, Johns-Hopkins University, Baltimore, Md.

Birmingham, Ala., May 19. "Processes of Preparation and Commercial Uses of Blast Furnace Slag," C. E. Ireland. G. L. Bentley, secretary, the Ingersoll-Rand Co., 1802 American Trust Building, Birmingham, Ala.

Portland, Ore. June 22 to 25. Pacific Coast Regional Meeting.

Society of Automotive Engineers

San Francisco Group. April. 30. "Six-Wheel Trucks." Ethelbert Favary.

Milwaukee Section. May 6.

Pennsylvania Section. May 12. Trip to Naval Air Station, Lakehurst, N. J., with talk by Naval officers.

Buffalo Section. May 19.

American Society for Steel Treating

Schenectady, N. Y. Spring Section Meeting. May 28, 29 and 30. Hotel Van Curler. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

National Association of Cost Accountants

Philadelphia Chapter. May 8. "Material Control." N. M. Cartmell.

Milwaukee Chapter. May 12, Annual election of officers.

New York Chapter. May 12. "Cost Accounting to Aid Financial Control and Forecasting." S. H. Childs.

Buffalo Chapter. May 14. Annual election of officers.

Twin Cities Chapter. May 14. A review of all previous topics of the series. Election of officers.

Cleveland Chapter. May 20. "Retailing-Reaching the Consumer," and "Uniform Costs for the Retailer."

Rochester Chapter. May 20. "Methods of Applying Selling and Administration Expenses to the Product." Prof. Charles Reitell.

Syracuse Chapter. May 20. Subject to be announced. Percy S. Brown, the speaker.

Detroit Chapter. May 21. "Experience in Simplifying the Cost System."

Trade Catalogs

Pyrometers. The Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, Ill. Half-tone illustrations on the opening pages of the catalog show the interior of the factory where the pyrometers are made; in the center is an insert that represents a sample chart; and on the other pages are photographs and text describing the pyrometers made by the Republic company. Accessories are also illustrated and described and there are some tables and charts to further convince the reader. The entire catalog is exceptionally attractive and well produced.

Saws. The Henry G. Thompson & Son Co., New Haven, Conn. The Milband positive-feed cutting-off machine tool is described in this catalog. The six selective feeds are stressed and other features mentioned are accuracy, durability and the ability of one blade to cut all materials. It is claimed that the machine is faster than gravity-feed, band or hack saws and that less metal wastage is produced than with cold saws or heavy hack saws. There are illustrations, tables of specifications and other data.

Forthcoming Meetings

The National Supply and Machinery Distributors' Association. Twentieth annual convention, Ambassador Hotel, Atlantic City, April 27, 28 and 29. George A. Fernley, secretary and treasurer, 505 Arch St., Philadelphia, Pa.

Southern Supply & Machinery Dealers' Association and the American Supply & Machinery Manufacturers Association. Joint Convention. The Atlanta-Biltmore Hotel, Atlanta, Ga., May 5, 6 and 7. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

The Society of Industrial Engineers. National Convention. Hotel Winton, Cleveland, Ohio, May 6, 7 and 8. Executive secretary, George C. Dent, 608 S. Dearborn St., Chicago, Ill.

American Gear Manufacturers' Association. Ninth annual convention, May 6, 7 8 and 9. The William Penn Hotel, Pittsburgh, Pa. T. W. Owen secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Spring Meeting. Milwaukee, Wis. May 18, 19, 20 and 21. Calvin W. Rice, secretary, 29 West 39th St., New York City.

United States Chamber of Commerce. Thirteenth annual meeting, Washington, D. C., May 20, 21 and 22.

Division V of the American Railway Association. Business meeting June 16 to 18, Chicago. V. R. Hawthorne, 431 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer Meeting. Greenbrier Hotel, White Sulphur Springs, W. Va., June 16, 17, 18 and 19. C. F. Clarkson, secretary, 29 West 39th St., New York City.

American Society for Testing Materials. Twenty-eighth annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 22, 23, 24, 25 and 26. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

National Foreign Trade Council. Annual Convention. Seattle, Wash., June 24, 25 and 26. O. K. Davis, secretary, India House, Hanover Square, New York City.

American Railway Tool Foremen's Association. Annual convention, Hotel Sherman, Chicago, Ill., in August. G. G. Macina, C. M. & St. P. Ry., 1402 Calumet Ave., Chicago, Ill.

International Railway General Foremen's Association. Annual convention, Hotel Sherman, Chicago, Sept. 8, 9, 10 and 11. William Hall, secretary and treasurer, 1061 W. Wabash St., Winona, Minn.

New Haven Branch of the American Society of Mechanical Engineers. Fifth annual machine tool exhibition, Sept. 8 to 11. Mason Laboratory. H. R. Westcott, chairman.

American Society for Steel Treating. Annual Convention and National Steel Exposition. Public Auditorium, Cleveland, Ohio. Week of Sept. 14. W. H. Eisenman, Secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Weakness continues to characterize the iron market. Although buying is slow, no marked recessions from present price schedules are anticipated in the immediate future. The steel items in which price depressions are most marked are: wire products, openhearth billets, light rails, sheets, bars and structurals. The mill base on steel bars is $2@$2.10 per 100 lb., Pittsburgh; with shapes at $1.95@$2.10 and plates at $2@$2.10 per 100 lb. The minimum on shapes is down about 5c. and that on bars, 10c. per 100 lb. from the April 17 level.

Non-Ferrous Materials — The trend of the non-ferrous metals is exactly opposite that of iron and steel. Copper is ¼c. and tin 3¼c. per lb. above the April 17 level in New York warehouses. The extreme low point for tin was reached and passed, 20 days ago. General price firmness prevails in transmission belting.

(All prices as of April 24)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	23.27
Southern Ohio No. 2	23.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.26
Virginia No. 2	29.17
Basic	23.26
Grey Forge	23.75
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	26.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	23.77
Basic	23.77
Bessemer	23.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.60@2.70	3.89	3.45	3.80
No. 12	2.65@2.75	3.94	3.50	3.85
No. 14	2.70@2.80	3.99	3.55	3.95
No. 16	2.80@2.90	4.09	3.65	4.15
Black				
Nos. 17 and 21	3.15@3.35	4.40	4.15	4.30
Nos. 22 and 24	3.20@3.40	4.45	4.20	4.35
Nos. 25 and 26	3.25@3.45	4.50	4.25	4.40
No. 28	3.30@3.50	4.60	4.35	4.50
Galvanized				
Nos. 10 and 11	3.45@3.60	4.60	....	4.50
Nos. 12 and 14	3.55@3.70	4.70	....	4.60
No. 16	3.70@3.85	4.85	....	....
Nos. 17 and 21	3.85@4.00	5.00	....	4.90
Nos. 22 and 24	4.00@4.15	5.15	3.00	5.05
No. 26	4.15@4.30	5.30	4.15	5.20
No. 28	4.45@4.60	5.60	5.45	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	59½%	48%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	56½%	45%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%, less 5%; class A, plus 23%. Cast iron, standard sizes, 36% off.

Size, Inches	List Price per Foot	Diameters Inches — External	Diameters Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.85	8.00	7.20
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	7.00	8.25	7.85
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00@3.10 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. Chicago, 3/32, 8.85c.; 5/32, 7¾c.; ⅛, 7.95c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.12½
Tin, 5-ton lots, New York			55.00
Lead (up to carlots), St. Louis	7.40	New York	8.25
Zinc (up to carlots), St. Louis	7.00	New York	7.75

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	13.50	16.00	15.50
Copper sheets, base	21.75	21.50	22.00
Copper wire, base	19.25	21.25	20.00
Copper bars, base	20.87½	21.50	22.50
Copper tubing, base	23.75	24.25	24.00
Brass sheets, base	18.12½	18.62½	18.37½
Brass tubing, base	22.75	25.25	26.00
Brass rods, base	15.87½	16.37½	18.37½
Brass wire, base	18.62½	20.12½	20.00

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1-15 ton lots	27.20	28.00	27.00
Zinc sheets (casks)	11.00	11.50	11.37
Solder (½ and ½), (case lots)	37.00	35.00	.....
Babbitt metal (83% tin)	60.00	63.00	50.00
Babbitt metal (35% tin)	28.00	20.50	28.00
Nickel (ingots) f.o.b. refinery	31.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	38.00	.....	.....
Nickel (shot) f.o.b. refinery	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel Metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
		Cold rolled sheets (base)	50.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.00@11.50	11.25	10.50@11.00
Copper, heavy, and wire	10.75@11.00	11.00	10.25
Copper, light, and bottoms	9.25@9.75	9.00	9.00
Heavy lead	6.25@6.50	6.25	6.50@6.75
Tea lead	5.25@5.50	3.75	5.50@5.75
Brass, heavy, yellow	6.75@7.25	6.50	7.00
Brass, heavy, red	8.50@8.75	8.75	8.00
Brass, light	5.75@6.00	5.50	6.00
No. 1 yellow rod turnings	7.25@7.50	7.00	7.75
Zinc	4.00@4.25	3.75	4.25

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$11.75	$11.45	$11.00
"A" Grade:				
IC,	14x20	9.50	9.40	8.50
	Coke Plates—Primes.			
100-lb.,	14x20	6.50	6.10	6.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.80@6.90	6.75

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.14
Cotton waste, colored, per lb.	.10@.15½	.18	.09½
Wiping cloths, 13¼x13¼, per lb	.17	36.00 per M	.11*
Wiping cloths, 13¼x20½, per lb.	....	45.00 per M	.11*
Sal soda, per 100 lb. keg	2.25	2.25	2.00
Roll sulphur, per 100 lb. keg	3.60	3.25	2.85
Linseed oil, per gal., 5 bbl. lots	1.09	1.24	1.26
Lard cutting oil, 25% lard, per gal.	.60	.50	.32
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.33	.35	.21
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	30–10%	30–10%	30–10%
Heavy grade	20–5%	20–5%	20–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50–5%	50–10%	60%
Second grade	50–10–5%	60–5%	65%

*White, at washery.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0349
Cold finished shafting	per lb.	.0415	.0415	.044
Brass rods	per lb	.1587½	.1712½	.155
Solder (½ and ½)	per lb.	.37	.40	.39
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	.60	.60	.55
Machine oil	per gal.	.33	.33	.29
Belting, leather, medium	off list	30–10%	40–2½%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	$5.00
Emery paper	10.71	11.00	11.00
Emery cloth	28.00	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.50
Cloth	3.38	2.67	3.55
Fire clay, per 100 lb. bag	.....	.65	.75
Coke, prompt furnace, Connellsville	per net ton		3.25@3.75
Coke, prompt foundry, Connellsville	per net ton		4.00@4.50
White lead, dry or in oil	100 lb. kegs		New York, 15.75
Red lead, dry	100 lb. kegs		New York, 15.75
Red lead, in oil	100 lb. kegs		New York, 17.25

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1⅛ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%. Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.50 per 100 lb. at Cleveland.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¼-in., $1.00 per 100. List plus 35% at New York warehouses; with hex. heads, $4.65 per 100 lb. net at Chicago.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¼x¼-in., 2c. each. Discount 70% for $\frac{9}{16}$-in. and smaller and 65% for ⅝-in. and larger.
Case hardened ¼x¼-in., 6c. each, less 50%.

Rivets, button heads, ¾-in., ⅞-in., 1-in. diam. x 2$\frac{1}{16}$-in. to 4½-in., $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1¼ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c., longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Fla., Uceta (Tampa P. O.)—Atlantic Coast Lines, 71 Broadway, New York City, F. H. Fechtig, Pur. Agt.—complete equipment, for yards, including machine shop, here.

Ill., Waukegan—General Boilers Co.—plate shear 4 to 6 ft. capacity ½ in. plate (used).

Ill., Chicago—Bates Valve Bag Co., 8200 South Chicago Ave., C. D. Rexstrew, Pur. Agt. (bag fillers)—miscellaneous tools and equipment for proposed factory.

Ill., Chicago — Chicago Lock Co., 154 Whiting St., L. B. Shinn, Pur. Agt. (lock manufacturers)—lathes, drills, riveting machines, small tools, etc., for new factory.

Ill., Chicago—Chicago Roller Skate Co., 4458 West Lake St., W. Ware, Pur. Agt. (mfg. of roller skates)—Foster or equal hand screw machine, No. 2 or No. 3, back geared with power feed to turret.

Ill., Harvey—Bd. of Education, c/o G. N. Burnett, Secy., 15544 Loomis St.—equipment for manual training and shops department.

Mich., Detroit — J. Ganster, 330 East Bethune St.—sheet metal brake for general sheet metal work.

Minn., Minneapolis—Buss Metal Co., 2728 Nicollet Ave., O. W. Buss, Pres.—high power brake and welding equipment, will be purchased on completion of new plant.

Mo., St. Louis—National Machinery Mfg. Co., 3505 Page Blvd. (machinery manufacturers)—34-E Oliver verical spindle and disc sander equipped, with motor drive; 120 in. or 15 ft. Herman molding machine and rollover (used).

N. Y., Brooklyn—Atlantic Service Co., 711 Caton Ave., A. O. Schaefer—small grinding machines, for grinding hardened threads up to 12 threads per in.

N. Y., Buffalo — Henbusch Co., 656 Genesee St.—machinery for manufacturing light metal products.

N. Y., Buffalo—McManus Steel Construction Co., Ferry and Leslie Sts.—equipment for template shop.

O., Columbus—Somers Benbow Lumber Co., 483 Neilston St., D. S. Benbow, Mgr.—12 in. rip saw; 14 in. jig saw; 6 to 8 in. sticker, etc.

O., Toledo—Toledo Steel Products Co., 3300 Summit St.—No. 93 Monarch simplex furnace, 1,000 lb. capacity.

Pa., Brackenbridge—Allegheny Steel Co.—1 core oven.

Pa., Bradfordwoods—R. G. Noll—small screw cutting lathe.

Pa., East Pittsburgh — Westinghouse Electric & Mfg. Co., Chamber of Commerce Bldg., Pittsburgh—2 small lathes, milling machines, H. S. drill press, sensitive drills, broaching machines, 24 in. shaper, boring mill, and special machinery for copper plate, for plant here.

Pa., Mercer — I. J. Pizar—drill press, lathe and cylinder reboring machine.

Pa., Philadelphia—Pennsylvania R.R. Co., Broad St. Station, S. Porcher, Gen. Pur. Agt.—15 ton, 97 ft., 10 in. span overhead electric crane for shop at Pitcairn.

Pa., Pittsburgh—Pittsburgh Piping and Equipment Co., 35th and Charlotte Sts., A. Teggel, Pur. Agt.—5 ton crane, 39 ft., 4 in. span; 10 ton crane, 52 ft. span.

Pa., Pittsburgh—The Koppers Co., Union Trust Bldg.—lathes, drill presses, 24 in. shaper, hack saw and double end grinder.

Pa., Pittsburgh — United Engineering & Foundry Co., Farmers Bank Bldg., W. E. Sanborn, Pur. Agt.—1 core oven for Canton.

Pa., Pittsburgh—West Penn Power Co., West Penn Bldg.—125 ton trolley, and 100 ton bridge crane.

Tenn., Nashville — E. W. Cooper, 174 Third Ave.—5 ton, 50 ft. overhead traveling crane, a.c., 3 phase, 60 cycle, 220 v.

Tex., Palestine—W. C. Dodd—machinery for crate and basket factory.

Wis., Marshfield—Felker Bros. Mfg. Co.—equipment including machine tools for new steel tank manufacturing plant.

Wis., Milwaukee — Central Bd. of Purchase, D. W. Hoan, Chn., will receive bids until May 4—5 ton full revolving truck mounted crane; 1 ton, full revolving caterpillar crane.

Wis., Waukesha—Ehlert Cabinet Co., c/o S. Breese, Jr., 510 McCall St.—woodworking machinery.

Opportunities for Future Business

Calif., Berkeley — Hall-Scott Motor Co., 5th and Snyder Sts., awarded contract for the construction of a factory on Snyder Ave. $22,000.

Calif., Brawley — Brawley High School District is having preliminary plans prepared for the construction of a school building, including shops, etc. Estimated cost $175,000. G. S. Wilson, 646 West 9th St., Riverside, Archt.

Calif., Long Beach—U. S. Tool Co., 3303 Cherry Ave., awarded contract for the construction of a machine shop. Estimated cost $10,000.

Calif., Los Angeles—Bimini Income Properties Co., c/o J. J. Frauenfelder, Story Bldg., Archt., is having plans prepared for the construction of a 95 x 105 and 50 x 160 ft. garage on Bimini Pl.

Calif., Los Angeles—Southwest Hardware Co., 4807 Second Ave., awarded contract for the construction of a 2 story, 80 x 140 ft., warehouse and factory, on Atlantic St.

Calif., Los Angeles — United Furniture Mfg. Co., 255 Stimson Bldg., awarded contract for the construction of a 2 story, 40 x 165 ft. factory addition on 59th St.

Calif., Sacramento — McLaughlin Sheet Metal Wks., 221 J St., will soon award contract for the construction of a 1 and ½ story metal shop.

Calif., San Francisco — Bodinson Mfg. Co., 11 Minna St., will build a 2 story plant for the manufacture of machinery, at San Bruno and Leland Aves., by day labor. Estimated cost $10,000. F. A. Johnson, 11 Minna St., Archt.

Calif., San Francisco — City is having plans prepared for the construction of a metal shop, for manual training, at Francisco school. Estimated cost $5,500. J. Reid, City Hall, City Archt.

Calif., San Francisco—Pacific Box Factory, Beach and Taylor Sts., plans to rebuild factory to replace fire loss. Estimated cost $100,000.

Calif., San Francisco—J. S. Potter, 315 Montgomery St., awarded contract for the construction of a 6 story garage, on Bush St., near Kearny. $150,000.

Calif., Taft—United Electric Co. awarded contract for the construction of a 25 x 125 ft. factory.

Fla., Uceta (Tampa P. O.)—Atlantic Coast Lines, 71 Broadway, New York City, plans the construction of yards, including machines shop, etc., here. J. E. Willoughy, Ch. Engr.

Ind., Muncie — Kitselman Bros. Fence Mfg. Co., South Council St., is receiving bids for the construction of a 3 story, 175 x 220 ft. factory, on Council St. Estimated cost $85,000.

Ind., Terre Haute—Shourds-Stoner Co., 510 Tribune Bldg., Archts. and Engrs., will receive bids about May 15th for the construction of a group of buildings including 2 story 60 x 240 ft. car, machine, and carpenter shops, etc., for T. H. I. & E. Traction Co., 725 Wabash Ave. Estimated cost $90,000. Graves Co., Engr.

Mass., Cambridge (Boston P. O.) — B. Goldfine, 11 Beacon St., Boston, plans the construction of a one and two story stores and garage building, at Massachusetts Ave. and Roseland St., here. Estimated cost $200,000. Architect not selected.

Mass., Cambridge (Boston P. O.)—J. Stewart, 976 Massachusetts Ave., is having plans prepared for the construction of a repair garage at Massachusetts Ave. and Bay St. Estimated cost $40,000. A. McNaughton, 44 Bromfield St., Boston, Archt.

Minn., Minneapolis—Buss Metal Window Co., 2728 Nicollet Ave., O. W. Buss, Pres., has tentative plans for the construction of a 100 x 100 ft. plant, first unit 30 x 100 ft. for the manufacture of metal windows. Estimated cost $40,000.

Mo., St. Louis — Anheuser-Busch, Inc., 9th and Pestalozzi Sts., awarded contract for the construction of a 113 x 125 ft. addition to wagon factory, on 2838 South Third St. Estimated cost $40,000.

N. Y., Dunkirk—American Locomotive Co., North Jay St., Schenectady, R. H. White, Engr., is receiving bids for the construction of car shops, here.

O., Cleveland—Ohio Forge Co., 2955 East 92nd St., has had plans prepared for the construction of a 60 x 71 ft. shop, at plant. Estimated cost $40,000. Private plans.

O., Dayton—L. T. Cooper, Bond Bldg., awarded contract for the construction of a 3 story garage and mercantile building, on West 1st St. $250,000.

Pa., Crum Lynne—Eagan & Johnson Co. awarded contract for the construction of a 50 x 200, 50 x 80 and 50 x 60 ft. plant additions for the manufacture of castings. Estimated cost $60,000.

Pa., Newell—The Pittsburgh & Lake Erie R.R. Co., P. & L. E. Terminal Bldg., Pittsburgh, is receiving bids for the construction of a 21x116 ft. round house addition here. A. R. Reymer, P. & L. E. Terminal Bldg., Pittsburgh, Ch. Engr.

Pa., Philadelphia—Fairmount Foundries, 38 Westmoreland Pl., awarded contract for the construction of a 90x97 ft. foundry addition, at American St. and Westmoreland Pl.

Pa., Philadelphia — Horn Surgical Co., 701 Vine Pl., awarded contract for the construction of a 1 story, 66 x 103 x 77 ft. factory, at 53rd St. and Meeting House Lane. Noted Apr. 16.

Pa., Philadelphia — Leeds & Northrup Co., 4901 Stenton Ave., awarded contract for the construction of a 2 story, 60 x 100 ft. plant addition, for the manufacture of electric measuring instruments. Estimated cost $45,000.

Pa., Philadelphia — O'Brien Cooperage Co., Wharton and Water Sts., will soon award contract for the construction of a 2 story, 60 x 107 ft. factory at plant. Estimated cost $40,000. C. E. Oelschlager, 1615 Walnut St., Archts.

Pa., Philadelphia—D. Weber & Co., 5th and Locust Sts., awarded contract for the construction of a 101,365 sq.ft. plant for the manufacture of paper boxes, including machine shop, etc., at Tioga and Richmond Sts.

Tex., Dallas — Cary-Schneider Investment Co., 320 Medical Arts Bldg., awarded contract for the construction of a 4 story, 108 x 165 x 50 ft. garage, at Paul and Pacific Sts. Estimated cost $150,000.

Tex., Palestine—W. C. Dodd—plans the construction of a crate and basket factory. Estimated cost $35,000.

W. Va., Weirton—Weirton Steel Co. plans the construction of a tube mill.

Wis., Madison—French Battery Co., 2317 Winnebago St., is having plans prepared for the construction of a 200 x 200 ft. plant and warehouse. Estimated cost $40,000. Private plans.

Wis., Marshfield—Felker Bros. Mfg. Co. plans the construction of a 2 story plant for the manufacture of steel tanks. Architect not selected.

Wis., Racine—A. A. Wickland & Co., 5 South Wabash Ave., Chicago, will receive bids about May 1st for the construction of a 1 story, 90 x 240 ft. foundry on Kewanel St. for Standard Foundry Co., T. Jane, Mgr., 7500 Kewanel St. Estimated cost $250,000. Noted Apr. 23.